PB82-103789

Proposed Issuance of a New Source National Pollutant Discharge Elimination System Permit to Mississippi Chemical Corporation, Hardee County Phosphate Mine, Hardee County, Florida

(U.S.) Environmental Protection Agency
Atlanta, GA

Aug 81

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Mississippi Chemical Corporation has proposed to operate an open pit phosphate mine and beneficiation plant and rock dryer on 14850 acres in west central Hardee County, Florida. Mining and processing will produce 3 million tons of phosphate rock per year for 32 years. The EIS examines project alternatives, impacts, and mitigative measures related to air, groundwater, surface water, radiation, ecological, socioeconomic, and cultural systems.

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United States
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Agency

Region 4
345 Courtland Street, NE
Atlanta, GA 30365

EPA 904/9-81-058
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EPA

Environmental Impact Statement

DRAFT

Mississippi Chemical Corporation
Hardee County Phosphate Mine
Hardee County, Florida

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

EPA 904/9-81-058
NPDES Application Number:
FL 0037745

Draft
Environmental Impact Statement

for
Proposed Issuance of a New Source National
Pollutant Discharge Elimination System Permit

to
Mississippi Chemical Corporation
Phosphate Mine
Hardee County, Florida

prepared by:
U.S. Environmental Protection Agency
Region IV, Atlanta, Georgia 30365

cooperating agency:
U.S. Army Corps of Engineers
Jacksonville District
Jacksonville, Florida 32201

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Comments will be received until OCT 30 1981

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8/17/81
Date

EXECUTIVE SUMMARY FOR
ENVIRONMENTAL IMPACT STATEMENT

HARDEE COUNTY PHOSPHATE MINE
MISSISSIPPI CHEMICAL CORPORATION

(X) DRAFT
( ) FINAL

U.S. Environmental Protection Agency, Region IV
345 Courtland Street NE
Atlanta, Georgia 30365

1. Type of Action: Administrative (X) Legislative ( )

2. Description of Action

Mississippi Chemical Corporation (MCC) is proposing to construct and operate a phosphate mine, beneficiation plant, and rock drying facility in west-central Hardee County, Florida. The USEPA Region IV Administrator has declared the proposed phosphate mine to be a new source as defined in Section 306 of the Federal Clean Water Act.

In compliance with its responsibility under the National Environmental Policy Act (NEPA) of 1969, the USEPA Region IV Administrator has determined that the issuance of a new source National Pollutant Discharge Elimination System (NPDES) permit for the proposed mining and beneficiation facility would constitute a major federal action significantly affecting the quality of the human environment. Therefore, an Environmental Impact Statement has been prepared.

The proposed facility, the Hardee County Mine, encompasses 14,850 acres of which approximately 9,000 acres are deemed mineable according to present economic, environmental, and technological limitations. The mining operation is planned to produce 3 million tons of phosphate ore annually for a period of 31.5 years. MCC, a farmer-owned fertilizer producing cooperative, presently operates a chemical complex in Pascagoula, Mississippi which requires approximately 1 million tons of dry phosphate rock per year for the production of fertilizers. To ensure its ability to obtain long-term supplies of phosphate ore for its fertilizer production, MCC proposes mining the tract of land under consideration. The remaining 2 million tons of annual mine production would be sold to other customers in order to generate sufficient revenue to make the mine an economically viable project.

Components of the proposed facilities would include two draglines with 45 cubic yard buckets; hydraulic ore transportation via pipelines from the mine to a central washer for ore disaggregation and pebble recovery; a feed preparation and flotation plant for extraction of finer phosphates; a drying facility to reduce moisture in the phosphate rock from 13 percent to 2 percent; and shipment via rail, principally to Tampa from which the rock would be barged to Pascagoula and other customer- receiving ports.

The mining plan proposed by MCC calls for mining approximately 9,000 acres in Hardee County. As proposed, three wetlands on the property, totalling 120 acres of swamp and 113 acres of marsh, would be preserved. These wetlands would not be affected by mining operations unless, and until, the USEPA determines that MCC has proven the feasibility of creating wetlands of essentially the same ecological functions. An additional 440 acres of wetlands (including 35 acres of swamp) on the site would be unaffected by the proposed action. The mining plan would include disturbance of approximately 4 miles of 5 cfs streambeds.

The proposed water management plan would divide the needed supply between surface and ground water resources and would minimize mining process consumption. The Consumptive Use Permit issued by the Southwest Florida Water Management District (SWFWMD) allows ground water withdrawal at a rate of 17.4 million gallons per day (mgd) for the first 3 years. During this time, a 200 acre surface water reservoir would be constructed to provide storage for surface water diverted from Brushy Creek. Approximately 5.1 mgd (annual average) would be taken from the storage reservoir, thereby reducing ground water use to 12.3 mgd for the remainder of the project life. A schedule of minimum flows has been established by SWFWMD to assure that downstream uses of Brushy Creek would not be impaired.

The proposed waste disposal plan would be a modification of the conventional and sand/clay mix methods. A four-foot thick sand/clay cap (approximate ratio of 8 parts sand to 1 part clay by weight) would be placed on approximately half of the clay disposal areas. This would result in creation of a minimal number of lakes and above-grade storage areas. Of the 10,722 acres to be used for waste disposal, less than 3,700 acres would be above-grade after final reclamation is complete. Areas not receiving a sand/clay cap would be partially capped with a mixture of sand tailings and overburden.

The proposed reclamation plan would be accomplished by the physical restructuring and refilling of disturbed sites (mine cuts and clay storage areas), followed by revegetation. The proposed methodology would return the site to land forms compatible with its rural, agricultural setting and would reclaim approximately 82 percent of the disturbed wetland acreage. The reclaimed site would consist of improved pasture, marsh and swamp environments, two lakes, and meandering streambeds providing surface drainage. The proposed plan aims to provide long range water quality and biological diversity as well as aesthetic values in land form diversity, wildlife protection, recreational uses, and water resources. As proposed, wetland areas and streams, if successfully recreated, would be of generally better quality than those presently on the site.

3. Major Alternatives Considered

A. Beneficiation plant sites

Alternatives were evaluated primarily with regard to minimizing loss of phosphate resource, water pumping, ore and waste transportation, road and utility construction, and destruction of environmentally sensitive areas. A site adjacent to the existing rail facilities was identified as preferable from an engineering standpoint. No substantial difference in environmental impacts was noted among the sites considered.

B. Mining Methods

Alternatives examined were electric draglines, dredges, and bucket wheel excavators. Mining methods were evaluated to assess ore recovery rates, energy use, water use and conservation, environmental resources, and safety. Draglines were identified as the most environmentally preferable and energy-efficient alternative.

C. Matrix Transport

Ore transportation alternatives were evaluated considering technical and operational feasibility, cost, energy use, water conservation, and impact to the environment. Conventional slurry pumping, conveyors, and trucks were considered. Conveyors would be the environmentally preferable alternative and would be energy-efficient. However, they are an unproven technology in the central Florida phosphate region and are capital and maintenance intensive. Slurry pumping is proven technology, extremely flexible, much less costly, and environmentally acceptable.

D. Ore Processing

Beneficiation process alternatives were evaluated for energy and water use efficiencies and for environmental impacts. Alternatives considered were conventional beneficiation, direct acidulation, and dry beneficiation.

Dry beneficiation and direct acidulation are energy-intensive and, although they would eliminate clay disposal areas, air emissions would increase substantially. Both are unproven technologies in the Central Florida phosphate district. Although clay disposal areas are created by conventional beneficiation practices, this is considered the preferred alternative.

E. Process Water Sources

Alternatives considered were use of groundwater, surface water with rainfall catchment, and a combination of ground and surface water. Water sources were evaluated with consideration for conserving this regional resource while providing a sufficient quality and quantity of process water. A combination of using ground and surface water resources was identified as a workable and environmentally acceptable alternative. MCC has been issued a consumptive use permit from the Southwest Florida Water Management District for the proposed facility.

F. Wastewater Treatment

Effluent discharge alternatives considered included surface and ground water disposal. Ground water discharge through connector wells to the Floridan aquifer would not offer any significant environmental advantages and would be much more costly than surface discharge. Discharge of effluents to surface waters would occur during the rainy season and would meet applicable federal and state effluent limitations.

G. Rock Drying

Rock drying alternatives were evaluated to select an alternative which provided an environmental, energy, and cost-effective means of meeting project needs. Alternatives assessed were construction of a dryer at the mine site, shipment of wet rock with drying at a remote location, and shipment and processing of wet rock.

Rock drying at the mine site was determined to be environmentally acceptable. It would be the most technologically and economically preferred alternative and, based on current and projected near-term demand for wet and dry phosphate rock, would also be the least energy intensive. Air emissions would meet federal and state air quality standards. Based on current data, rock drying at MCC's Pascagoula facility would probably require emission offsets from existing industries since the available air quality degradation increment in the area is extremely small. Additionally, a Class I area in proximity to the Pascagoula fertilizer plant might be adversely impacted by emissions from a rock dryer. Conversion from dry rock phosphate processing to wet rock processing at MCC's Pascagoula facility would require substantial financial commitments. An initial analysis has indicated conversion would probably create water quality problems at the complex.

H. Waste Disposal and Reclamation

Evaluation of waste disposal and reclamation plans focused on methods to dispose of sand and clay wastes in a manner that would reduce above-grade storage and economically restore disturbed land to a productive state. Physical restoration and revegetation were considered in light of existing and planned environmental systems. Conventional, sand/clay mixing, and sand/clay cap methods of waste disposal were considered. Land-in-lakes reclamation and minimum above-grade storage were evaluated.

Because of the nature of the ore matrix and the geology at the MCC site, a sand/clay mix reclamation strategy (normally a preferred alternative) has been determined to be infeasible. By using a sand/clay cap on the waste disposal area, a more effective use of the limited quantities of sand would be achieved. This technique would reduce above-grade clay storage to about 3,700 acres. With the conventional waste disposal method approximately 7,500 acres of above-grade clay storage would be required.

I. Wetlands Preservation

Preservation alternatives included direct application of the USEPA Areawide EIS wetlands categories, site-specific application of those same categories, wetlands systems protection and protection of wetlands as specified in the Hardee County Development Order (Appendix C). Alternatives were primarily evaluated with consideration of effects on ecological functions of the wetlands and on phosphate ore recovery.

Based upon the USEPA's evaluation of the project and onsite wetlands, a site-specific application of the USEPA Areawide EIS wetlands categorization criteria was identified as an environmentally acceptable alternative. This alternative identifies preserving three onsite wetlands totalling 233 acres and conducting a 90-acre wetland restoration program to demonstrate the ability of creating wetlands in historically wet areas.

J. Phosphate Rock Transport

Alternatives evaluated included railroad with trucks as emergency mode, trucks only, pipeline to port, and conveyor. Current transport practices in the phosphate district rely predominantly on the rail system. Rail transport was determined to be the environmentally and economically preferred alternative.

K. No Action

A no action alternative was evaluated to consider the effects and implications of not issuing an NPDES permit to MCC for the phosphate mine. This would effectively preclude mining on the site at the present time. Seasonally heavy rainfall would prevent implementation of a zero discharge water management design. (A zero-discharge design would not require an NPDES permit).

No action would allow the area to be left in its present environmental and socioeconomic state for at least the near future. Air resources would not be impacted by a rock dryer. Land use would remain predominantly unimproved pasture. The existing wetlands and water resources would not be restructured. No intensive development would be expected at the site in the immediate future.

No action would result in loss of project investment to MCC and its farmer-owners. It would also cause a loss to MCC of approximately 94.5 million tons of phosphate rock reserves. Though reserves would likely be mined at some future data when high-grade phosphate reserves are depleted and the ore on the MCC site becomes strategically and economically more valuable, it is unlikely that MCC would retain ownership until that time.

L. USEPA's Preferred Alternative and Recommended Action

Based on the environmental, technical, and economic analyses detailed in the DEIS and supporting documents, the USEPA's preferred alternatives for the major project components are as follows:

Mining: Dragline
Matrix Transport: Slurry pipeline
Matrix Processing: Conventional beneficiation
Rock Drying: Dryer at Ona Site
Process Water Source: Ground/surface water
Wastewater Treatment: Discharge to surface waters
Reclamation: Conventional with sand/clay cap
Wetlands Preservation: Site-specific application of Areawide EIS wetland criteria

As noted, the USEPA's preferred alternatives for the major project components are generally identical to those proposed by MCC. With regard to waste disposal, a sand/clay mix process would normally be environmentally preferable. However, because of the low ratio (<2.0 to 1) of sand to clay on the property, full implementation of this alternative is not technically possible. The sand/clay alternative proposed by MCC optimizes use of onsite geological resources and is environmentally acceptable.

The wetlands preservation alternative preferred by the USEPA is the site-specific application of the Areawide EIS wetland criteria. The site-specific alternative identified only the three onsite wetlands, totalling 233 acres (Figure 2.10-5), as being characteristic of Category I wetlands and worthy of preservation. The wetlands systems alternative (Section 2.10.4) identified two additional wetland areas (Areas A and C; Figure 2.10-6) as being of importance on the site. Because of the extensive stream channelization existing on the property, the small and isolated natures of most wetlands, and the generally lesser habitat and water quality value of these wetlands, they were not identified as characteristic of Category I wetlands. In view of the loss of these wetlands, a 90-acre restoration program would be conducted as an integral part of the USEPA's preferred alternative. This 90-acre program would be in addition to the restoration program identified in the Hardee County Development Order alternative (Section 2.10.1). The extensively altered hydrologic character of the MCC property provides suitable sites for conducting a study of this nature. Functionally more valuable wetlands would likely be created during reclamation of the property for the wetlands which are not preserved.

4. Summary of Major Environmental Effects

Each of the selected alternatives was integrated into the appropriate land or water management strategy: the mining plan, waste disposal/ reclamation plan, and water management plan. Environmental impacts of the proposed activity were then assessed. The major emphasis of the impact assessment was to identify means of minimizing the degree and extent of negative impacts caused by the mining operation at any one time and to minimize the permanent alteration and/or destruction of natural systems and environmental resources.

The direct effect of mining would be the physical destruction of much of the present natural vegetation and the alteration of the site's soils and topography. The proposed reclamation plan is intended to mitigate the long-term negative impacts of the mining operation. Major impacts to the three major topographic systems would be:

Land - Overall, 69 percent of the native upland vegetation would be lost. Reclamation is designed to replace most natural land communities with improved pasture, thereby largely precluding the re-establishment of original vegetation.

Land-Water Interface - There are approximately 2,980 acres of swamps and marshes on the site. Mining operations would not affect 440 acres (15 percent). An additional 233 acres (8 percent) would be preserved; mining or waste disposal on these wetlands would only be allowed if the USEPA determines at some future date that MCC has successfully demonstrated creation of wetlands onsite to an equivalent functional capacity. The mining and reclamation plans would result in post project wetlands consisting of 425 acres of swamp (87 percent of present acreage) and 2,025 acres of marsh (81 percent of present acreage). The proposed reclaimed wetlands would have greater contiguity with surface streams than do those now in existence and would possess greater functional wetland value.

Water - Approximately 4 miles of streambeds with annual average flow greater than 5 cfs would be mined or used for waste disposal. Additional ephemeral streams on the site would be displaced. Aquatic areas would be stressed through changes in temperature, insolation, erosion, water table drawdown, and addition of various chemicals. Streambed reclamation would result in replacing predominantly channelized ditches with meandering, vegetated streams. Viable stream habitat would be maintained throughout the mine life by limiting mining activities to one side of a stream at a time and by creating a biologically functional alternate streambed sufficiently in advance of mining the existing streambed. Mining would create approximately 300 acres of lakes on the site, which is a significant expansion of the aquatic environment.

The proposed activity would thus significantly alter the site's original topography through strip mining and waste clay disposal activities. The long-term, net effects on topography are directly reflected in the proposed reclamation plan, which returns the site to pre-mining elevation and relief to the maximum possible extent. Approximately 2,200 acres would have a final elevation 40 to 45 feet above-grade and 1,500 acres would be approximately 25 feet above-grade.

Proposed mining activities would disturb the existing soils on approximately 72 percent of the site. Existing soil profiles would be destroyed and, in general, the surface horizon would be buried. Waste disposal and physical reclamation would result in three types of surface soils: overburden, sand/clay cap mix, and tailings/overburden mix. Each of the new, reclaimed soil types would have distinct agricultural and engineering properties that relate to post-reclamation land use potential.

The average annual ground water withdrawals would be limited to 12.3 mgd (17.4 mgd during first three years). During the fourth year of mining, approximately 5.1 mgd of water would be diverted from Brushy Creek Reservoir for project use. Approximately 3.3 mgd is expected to seep into ground and surface waters from waste storage areas so that consumptive water use would be 14.1 mgd.

The primary effect of withdrawals from the deep ground water system would be the lowering of the potentiometric surface within the area of influence of the wells. This effect would be extremely small in comparison to the large seasonal fluctuation. Potential impacts to water quality in the deep aquifer system might occur as a result of these withdrawals and by gradual recharge from the shallow aquifer to the deep aquifer system. Monitoring of the quality of ground water is required by the Southwest Florida Water Management District.

The primary effect of mining activities on the shallow ground water system would be the localized lowering of the water level within the system by mine pit dewatering. The proposed reclamation project might cause changes in water quality in the surficial aquifer as well as changes in on-site flow patterns within the surficial aquifer.

During active mining, stream flow in Brushy Creek would decrease by approximately 26 percent. After reclamation, the average flows of surface streams draining the site would be approximately the same as at present.

Discharges to streams from the plant water system may be necessary due to temporal variation in rainfall. It is anticipated that an average of 3.5 cfs could be discharged into Oak Creek during the period from June through September. This would increase the average flow in Oak Creek by approximately 21 percent during these months. Effluents discharged to Oak Creek would meet applicable federal and state effluent guidelines. Certain water quality criteria might not be met in-stream (see "Unresolved Issues," p. xiv).

The proposed mining activities would have both primary and secondary air quality effects. Primary effects would occur as a result of operation of the phosphate rock dryer; phosphate rock storage, handling, and transport; and fugitive dust from land clearing and reclamation activities. Secondary effects would result from transportation of materials and products associated with the proposed project. Primary emissions from the rock dryer and associated facilities would be very fine clay and phosphate rock particulates and by-products of the combustion of the fuel oil (e.g., sulfur dioxide and ash). Emissions from the proposed activities would not violate air quality standards or significantly degrade air quality. Sulfur dioxide and particulate matter emissions would satisfy New Source Performance Standards and BACT.

Noise levels associated with mine-related activities would not be intrusive or detrimental to sensitive receptors.

Mining, waste disposal, and reclamation activities would alter the distribution of radioactive materials in soils on the property. Future indoor radon daughter working levels (WL) could exceed USEPA proposed limits on clay storage areas if residences were built on these areas in the future. Remedial action, such as topsoil emplacement, might be necessary to lower these working levels. If the clay settling areas are excluded from such development for structural reasons or if topsoil replacement occurs, no other restrictions on land use would be required. All other reclaimed lands on the site are predicted to produce radon progeny levels below the proposed 0.02 WL remedial action level.

Radium-226 concentrations in surface water onsite and downstream could increase very slightly due to effluent discharge and runoff from mine lands. Concentrations should be less than 2 pCi/liter, which is below the drinking water standard of 5 pCi/liter. Ground water concentrations should be slightly reduced because the surficial materials would contain less radioactive material after reclamation than at present.

Calculated individual and population dose commitments from inhalation, ingestion, and direct exposure pathways (including food chain contributions and airborne particulates from rock drying) indicate that increases during any phase of the project could not be measured within the statistical variation of natural background levels.

The socioeconomic impacts of the proposed project would be generally beneficial. Operation of the mine would directly employ 450 workers. It is estimated that 70 of these workers would originate from the Hardee County labor force. The mine would produce approximate annual tax revenues of more than $6.5 million. The total economic benefits, including direct, indirect, and induced impacts, for the operating phase of the project would total $42.4 million annually. The mine would exert no directly discernable effects on community services and facilities as the operation would be self-sufficient in terms of minor medical treatment, water supply, fire and police protection, solid waste disposal, and internal transportation facilities. The mine would not measurably increase demand on regional facilities for education, major medical treatment, recreation, and transportation.

Long-term land use patterns should not be adversely affected by the mining activity. The planned mine reclamation program would return the site to land forms amenable to a variety of agricultural uses. The proposed mine site would be located near several other phosphate mines and, therefore, should not disrupt near-future land use trends in the area.

5. Mitigative Measures

Several measures which would serve to mitigate the impacts of the proposed project on the surrounding environment were identified during the environmental review process. These measures are outlined below:

- Implement a program to minimize impacts to the eastern indigo snake (a threatened species) which occurs on the site. The program would emphasize capture of the snake and release through coordination with the Florida Game and Fresh Water Fish Commission.
- Implement a program to excavate an aboriginal site eligible for National Register listing.
- Mine only one side of a stream at a time to prevent disruption of surface drainage and maintain biological systems in the streambed.
- Preserve from mining and waste disposal activities the major, functionally significant wetlands onsite (Figure 2.10-5). At such time as MCC has demonstrated the creation of wetlands having essentially equal functional values, MCC could re-open the possibility of mining the preserved areas with the USEPA.
- Conduct a 90-acre experimental wetland restoration program in Sections 31 and 32, T34S-R24E to demonstrate the ability of creating wetlands in historically wet areas.
- Implement a sand/clay capping technique to minimize above-grade clay storage areas and restore topography to as close to original conditions as possible.

6. Unresolved Issues

An aboriginal site on the property has been declared to be National Register eligible by the Keeper of the National Register (Appendix E). As proposed, MCC's project would destroy this site. In accordance with provisions of the National Historic Preservation Act (NHPA), the USEPA is required to initiate consultation with the Advisory Council for the purpose of mitigating the loss of this resource. Consultation will commence with release of the Draft EIS. It is the opinion of the State Historic Preservation Office that this cultural site should be excavated (see Appendix E).

The ambient concentrations in Oak Creek for dissolved oxygen and pH violate (are below) Florida Water Quality Standards for Class III waters. MCC proposes to discharge effluents to this creek and would need to obtain relief from the Florida Department of Environmental Regulation (e.g., for Site Specific Alternative Criteria) to discharge these parameters. In addition, specific conductance and oil and grease concentrations in the mixed stream might violate Florida water quality standards. This issue has not yet been resolved.

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JOINT PUBLIC NOTICE

U.S. Environmental Protection Agency
Region IV, Consolidated Permits Branch
345 Courtland Street, N.E.
Atlanta, Georgia 30365
404/881-4201

in conjunction with

Florida Department of Environmental Regulation
Twin Towers Office Building, 2600 Blair Stone Road
Tallahassee, Florida 32301
904/488-4807

Public Notice No. PH81FL190 September 3, 1981

NOTICE OF PUBLIC INFORMATION HEARING

ON

DRAFT ENVIRONMENTAL IMPACT STATEMENT, NOTICE OF PROPOSED ISSUANCE OF NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT, AND NOTICE OF CONSIDERATION FOR STATE CERTIFICATION OF THE NPDES PERMIT

A Draft Environmental Impact Statement (EIS) will be made available by the U.S. Environmental Protection Agency (EPA) to the EPA Office of Federal Activities and to the public on or about September 4, 1981, regarding the Mississippi Chemical Corporation's proposed phosphate mine and beneficiation plant to be constructed and operated near the Town of Ona in Hardee County, Florida.

The proposed project was determined by the Regional Administrator, EPA Region IV, to constitute a New Source under Section 306 of the Clean Water Act (33 U.S.C. 1251 et seq.) requiring issuance of an NPDES permit. Further, the issuance of the NPDES permit is subject to all provisions of the National Environmental Policy Act of 1969 (83 STAT. 852).

In order to insure full public participation on the proposed issuance of the required permit and determinations for the proposed project, a public information hearing will be held. The hearing is scheduled for October 21, 1981, and will begin at 7:30 p.m. in the Hardee County Agricultural and Civic Center, at Altman Road and Stenstrom Road, in Wauchula, Florida. The hearing panel will include representatives from EPA and the State of Florida.

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The hearing will be conducted informally; formal rules of evidence will not apply. Both oral and written comments will be accepted, and a verbatim transcript of the proceedings will be made. For the accuracy of the record, written comments are encouraged. The Hearing Officer may reserve the right to fix reasonable limits on the time allowed for oral statements.

This hearing is also being conducted to receive comments on the proposed issuance of a National Pollutant Discharge Elimination System (NPDES) Permit, NPDES No. FL0037745. The permit application describes one proposed discharge point from the facility. Proposed outfall Serial No. 001 would discharge from the clear water pond to Oak Creek at a location near the Vandolah Plant site. The receiving stream is a tributary to the Peace River and is classified by the State of Florida as a Class III Water suitable for Contact Recreation and the Management and Propagation of Fish and Wildlife.

The proposed NPDES permit contains limitations on the amounts of pollutants allowed to be discharged and was drafted in accordance with the provisions of the Clean Water Act (33 U.S.C. Section 1251 et seq.) and other lawful standards and regulations. The permit limitations and other permit conditions are tentative and open to comment from the public both in writing and at the public hearing.

A fact sheet which outlines the applicant's proposed discharges and EPA's proposed pollutant limitations and conditions is available by writing or calling EPA. A copy of the draft permit is also available from EPA. The administrative record, including the application, draft permit, fact sheet, environmental impact statement, comments received, and other information are available for review and copying at 345 Courtland Street, 2nd floor Atlanta, Georgia, between the hours of 8:15 a.m. and 4:30 p.m., Monday through Friday. A copying machine is available for public use at a charge of 20¢ per page.

Persons wishing to comment upon or object to the project, the Draft Environmental Impact Statement, the NPDES permit, and the proposed permit limitations and conditions are invited to respond in writing by October 30, 1981, to the U.S. Environmental Protection Agency, 345 Courtland Street, N.E., Atlanta, Georgia 30365, ATTENTION: Mr. John E. Hagan III, P.E., Chief, EIS Branch. The NPDES permit number, FL0037745, should be included in the first page of comments. All comments received by close of business on October 30, 1981, will be considered in the formulation of final determinations regarding the Final EIS and the NPDES permit and permit conditions.

A Final EIS will be published after the close of the public comment period. The Final EIS will consist of a summary of the Draft EIS, the Agency's decision on this project, responses to comments received on the Draft EIS, the transcript of the public hearing, and any other relevant information or evaluations developed after publication of the Draft EIS. A copy of the Draft EIS should be retained if a complete evaluation of the project is desired.

The Florida Department of Environmental Regulation has been requested to certify the discharge(s) in accordance with the provisions of Section 401 of the Clean Water Act (33 U.S.C. Section 1251 et seq.). Comments on issuance of certification must be submitted to the state agency at the address above within forty-five (45) days of the date of this public notice. The state agency will co-chair the hearing in order to receive comments relative to state certification.

Copies of the Draft EIS, which includes the draft NPDES permit, are available for review at the following locations:

Bartow Public Library, Bartow, Florida
DeSoto County Public Library, Arcadia, Florida
Ausley Memorial Library, Wauchula, Florida
Manatee County Central Library, Bradenton, Florida
Selby Public Library, Sarasota, Florida
Lakeland Public Library, Lakeland, Florida
Tampa-Hillsborough County Public Library System, Tampa, Florida

Please bring the foregoing to the attention of persons who you know will be interested in this matter.

###

1.0 PURPOSE AND NEED FOR ACTION

1.1 REGULATORY ACTION

Under provisions of the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251 et seq.), Mississippi Chemical Corporation (MCC), the Applicant, has applied to the United States Environmental Protection Agency (USEPA) for a National Pollutant Discharge Elimination System (NPDES) permit for the proposed Hardee County Florida phosphate mine and beneficiation plant. In compliance with its responsibility under the National Environmental Policy Act (NEPA) of 1969, the USEPA has determined that issuance of an NPDES permit for the proposed project would constitute a major federal action significantly affecting the quality of the human environment. Pursuant to Council of Environmental Quality and USEPA procedures for implementing NEPA, this draft environmental impact statement (DEIS) has been prepared to provide federal, state, and local agencies and the concerned public with sufficient and comprehensible information to determine whether the project should be permitted and whether its probable impacts have been accurately assessed and adequately mitigated. The DEIS was prepared by a third party contractor (Dames & Moore), as provided for in the USEPA's implementing procedures. All work completed by Dames & Moore was reviewed by the USEPA before publication.

The USEPA also has the authority to issue or deny a Permit for Significant Deterioration (PSD) for the proposed project pursuant to the Clean Air Act of 1977. In addition, the proposed action will require Section 404 permits from the U.S. Army Corps of Engineers under the Federal Water Pollution Control Act Amendment of 1972. The Army Corps of Engineers administers this regulatory program and must determine whether the DEIS and FEIS on this project adequately fulfill the Corp's NEPA responsibility and whether issuance of the permit is in the public interest. The Corps of Engineers, Jacksonville District, is the cooperating agency for this DEIS.

1

1.2 MISSISSIPPI CHEMICAL CORPORATION ACTION

The purpose of Mississippi Chemical Corporation's (MCC) proposed Hardee County, Florida mine and beneficiation plant is to remove phosphate ore matrix from the ground, then remove the phosphate rock product by washing and beneficiation, and finally return the waste sand and clay to the mined areas for storage and eventual reclamation.

The necessity of this project can be described in terms of social, technical, and economic needs.

Social needs: Society's present demand for food and fiber cannot be met without the use of fertilizer. MCC plans to mine phosphate rock for use in fertilizer production.

Economic Needs: The economic needs have far-reaching effects throughout both the company and the local community. MCC is a farmer-owned fertilizer manufacturing cooperative. Sale of stock in MCC commits the company to deliver fertilizer to the farmer-owners. Fulfillment of that commitment requires the company to maintain an adequate, dependable supply of necessary raw materials. In the past, this requirement was fulfilled by long-term contracts, but in the last decade, it has become impossible to obtain long-term contracts for raw materials at reasonable terms. Therefore, the company obtained a large potash deposit; entered into a joint venture for gas and oil exploration to obtain supplies of natural gas to manufacture ammonia; obtained supplies of sulfur to make sulfuric acid; and purchased the tract of land presently under consideration to supply the need for phosphate rock. Approximately 1 million tons of phosphate rock per year from the proposed mine would be transported to MCC's Pascagoula, Mississippi fertilizer plant. The remaining 2 million tons per year would be sold to provide the income necessary to make the mining operation economically viable. MCC is actively seeking a partner to participate in the proposed mining venture and to use that portion of the production above MCC's needs.

Then the company's economic need translates into the economic need of its farmer-owners. Farmers use fertilizer because it increases their profit by increasing the yield from a given parcel of land.

Technical Needs: The MCC property presents some new, though not unique, problems that require technical solutions in order to permit efficient mining of the phosphate ore. As with many phosphate lands in central Florida that are currently being opened, the MCC tract has shallow overburden and deep matrix along with a high clay and low phosphate content. The technical expertise gained from the MCC project would become available to future phosphate mine operations in central Florida.

2.0 ALTERNATIVES EVALUATION

Prior to the development of a mineral deposit, appropriate mining and processing methods must be identified and selected. A number of factors must be considered in the selection of the methods used in order to ensure cost-effective recovery of the mineral resource with efficient and environmentally acceptable use of land and water, energy, and other resources, and with subsequent reclamation of the disturbed land for useful purposes. As part of its responsibilities under the National Environmental Policy Act, the USEPA must evaluate viable alternatives to any proposed action. Alternatives considered for this project are listed in Table 2.0-1. A summary of the proposed action appears in this section while more detailed information on the proposed action and the other alternatives is presented in Sections 2.1 through 2.14.

Mississippi Chemical Corporation plans to develop a phosphate mine and beneficiation plant on approximately 23 square miles (14,850 acres) which it presently owns or controls, located 10 miles west of Wauchula in west central Hardee County (Figure 2.0-1). About 9,000 acres on this site have economically mineable reserves of phosphate ore. Site preparation and construction of the beneficiation plant is planned to commence in mid-1983 and to be completed in about two years. Mining would cover a 32-year period, with an average annual production rate of 3 million tons of phosphate rock.

The proposed master mining plan is based on such considerations as process requirements, equipment design and utilization, ore grade and production requirements, environmental concerns, waste disposal planning, water recirculation and reclamation objectives (MCC, 1977). As the project evolves and planning details are developed, the mining sequence may be adjusted to accommodate geological, engineering, production, and environmental concerns. Under the proposed plan, MCC would mine the site with two large draglines working independently of each other. The areas to be mined and the expected mining sequence are shown on Figure 2.0-2.

The excavated phosphate ore would be made into a slurry and pumped to the beneficiation plant where the clay wastes and larger phosphate pebble would be removed by washing and screening. Then a flotation process would separate the remaining phosphate particles from the sand. This phosphate product would be allowed to drain, after which it might be dried and stored in silos near the plant. The rock would be shipped from the plant by railroad and barge to MCC's fertilizer plant at Pascagoula, Mississippi, and to other users of phosphate rock. Handling of the waste clays and sand is an integral part of the waste disposal/reclamation process.

The MCC mining operation would use concurrent mining-reclamation methods to allow rapid and economic reclamation of mined-out areas and to comply with the Hardee County Mining and Earth Moving Ordinance as well as all other applicable laws.

Various methods of reclamation are planned, including sand fill reclamation, clay settling area reclamation, and sand/clay capping. The use of a reclamation method in any area would be based upon the location and the nature of the disturbance. Reclamation of each mined area would be completed within two years following active mineral extraction, except for those areas used as clay settling areas. Clay settling areas would require from five to ten years before they were are sufficiently dewatered for grading and planting.

2.1 MINING METHOD

The factors that must be considered in the selection of a mining method for extraction of mineral deposits include: 1) the spatial characteristics of the deposit (such as size, shape, attitude or dip and strike of deposit, and depth); 2) the physical properties of the mineral deposit and the surrounding rock or sediments; 3) hydrologic conditions of the ground and surface waters; 4) economic factors, including grade of the ore (matrix), comparative mining costs, and desired production rates; and 5) environmental impacts of the mining and processing activities, including loss of critical habitats, effects on threatened or endangered species, condition of the post mining land surface after reclamation, and potential for air and water pollution.

Six different types of mineral deposits are recognized: massive, bedded, narrow vein, wide vein, lenticular or pocket, and placer. The phosphate deposits mined in central Florida are generally regarded as bedded deposits. Such deposits are usually sedimentary layers which parallel the layering of the surrounding rock units; the deposits are usually laterally extensive and of limited thickness. The proximity of the phosphate deposits to the land surface and the unconsolidated nature of the overburden favor the use of surface mining methods for the extraction of phosphate in Florida. Surface mining methods evaluated for use at the proposed MCC mine in Hardee County are dragline, dredge, and bucketwheel excavator (BWE). Prior to actual mining operations, all vegetation must be cleared from the land and provision made for equipment access. These site preparation activities are common and similar for all three methods of mining and thus are not addressed in the following sections.

2.1.1 Dragline (Proposed by MCC)

2.1.1.1 System Description

Large, electric-powered, walking draglines, which have buckets ranging from 7 to 65 cubic yards in capacity, are currently utilized for strip mining in the Florida phosphate district. Dragline excavators are essentially large cranes with a drag bucket on the hoist cable. Loading is effected by pulling the bucket toward the machine with a drag cable along the top layer of material. When the bucket is filled, it is hoisted, and the boom and bucket are moved to the desired dumping position. The empty bucket is then swung back to a suitable position for the next loading cycle.

Mining cuts averaging 300 feet wide and up to a mile long are excavated by the dragline by stripping and side casting the overburden material into adjacent mined-out areas. The exposed matrix is then mined and placed in a slurry pit located near the highwall.

G

The size and number of draglines required for a mining operation and the length and width of the mining cuts are determined by the characteristics of the deposits, principally overburden and matrix thickness; depth to water table; cohesiveness of the soils, and physical features such as property boundaries, power lines, road rights-of-way, and post mining/reclamation land use.

The characteristics of MCC's Hardee County phosphate deposit and the desired production levels are such that two large draglines, each with a 45 cubic yard bucket capacity, will be required.

2.1.1.2 Environmental Considerations

Draglines are able to use electricity efficiently, thereby helping to conserve energy. Recent studies (USEPA, 1979) indicate that dragline power consumption per ton of product is about half that of some other mining methods. Draglines allow complete recovery of phosphate matrix so that none of the resource is wasted . They also allow efficient management (isolation) of the leach zone when this is necessary. When draglines operate in "moist" conditions, fugitive dust is reduced.

In addition to clearing of vegetation in areas to be mined or used for waste disposal storage, which is common to all mining methods, physical access must be provided for the draglines. Transport routes should be selected to avoid disturbance of sensitive land uses which would not otherwise be effected by mining operations. Stream crossings are particularly sensitive to dragline movements.

When draglines are used, pits must be "dewatered" for efficient mining. This dewatering can affect the water table of adjacent property owners and sensitive habitats. Precautions will be taken to insure that mining activities do not cause significant indirect adverse impacts on sensitive habitats or on adjacent property owners.

2.1.1.3 Technical Considerations

Walking draglines are versatile machines that perform optimally when digging unconsolidated material. The long reach of the dragline enables it to dig and move overburden and mine the matrix without rehandling the materials.

Draglines can selectively mine and cast overburden. Of particular importance in most Florida phosphate mining is the proper placement of the leach zone material which often occurs at the point of overburden/ matrix contact. Draglines can selectively strip and place the leach zone material (which is high in radioactivity) near the bottom of the mining cut, subsequently covering the leach zone material with overburden spoils (Figure 2.1-1). However, MCC's Hardee County property contains a relatively thin overburden above a thick (though lower grade) matrix. The leach zone is not well defined and not always present. The relatively small volume of overburden, including leach zone, will all be placed at the bottom of the mine cut, and will be covered by waste clays after reclamation (Figure 2.1-1). Selective leach zone management is not required for the MCC operations.

Among the operating constraints of dragline usage is the requirement for essentially dry conditions in the mining cut for safety and optimum matrix recovery. High water table conditions in the overburden combined with unfavorable soil conditions, can result in high wall failures, which may be a safety hazard. In addition, efficient matrix recovery is dependent upon the ability of the dragline operator to detect the matrix horizons. Excessive water in the mine cut hinders proper matrix horizon identification. Normal dragline operation, with pit dewatering, provides good control of the mine cut and matrix.

2.1.2 Dredge

2.1.2.1 System Description

In the past, dredges were used to a limited extent in Florida phosphate mining; at present, dredges are used in North Carolina to

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partially strip overburden. Dredges provide a means for excavating submerged overburden and matrix. A typical dredge design consists of excavating equipment mounted on a barge; this provides mobility in the area overlying the ore body. The excavating part of the dredge is generally supported on a boom at the forward end. Several spuds, or retractable anchor posts, are generally located on the stern to hold it in a stable position and to allow pivoting.

There are two main dredge types, mechanical and hydraulic. Mechanical dredges excavate bulk material and fall principally into the following general categories: 1) grapple dredge, a dry land clamshell or dragline mounted on a barge; 2) dipper dredge, a barge-mounted power shovel; and 3) bucket ladder dredge, a chain of buckets moving from the work face to a point above the surface of the water.

Hydraulic dredges continuously remove sediments through the suction of a dredge pump, supplemented by mechanical excavators, when necessary. The principal types of hydraulic dredge employed in the mining industry are: 1) plain suction, the simplest form of hydraulic dredge which utilizes no excavator; and 2) cutterhead pipeline dredge, which is similar to the plain suction dredge but is equipped with a rotating cutter surrounding the intake end of the suction pipe. The cutterhead pipeline dredge is considered to be the most appropriate for use in Florida phosphate mining operations.

In order to mine MCC's Hardee County tract, at least two large capacity dredges would be required, one to strip the overburden, the other to mine the matrix. The overburden dredge would excavate at a distance ahead of the matrix dredge. Overburden material would be pumped to reclaim previously-mined areas. Decanted water from the overburden slurry would flow back to the dredge pond and be recirculated. The matrix dredge would excavate phosphate ore, and the resulting slurry would be pumped to the beneficiation plant.

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2.1.2.2 Environmental Considerations

Dredge systems are high energy users, and high water consumption is also characteristic of dredging operations due to water entrainment in clays and evaporation from the dredge ponds. Since a dredge cannot selectively spoil lenses of non-phosphate bearing material within the matrix zone, dilution of the ore occurs. This results in the transport of a lower phosphate to waste ratio to the beneficiation plant. Leach zone management is also difficult in dredging activities. As the clay is thoroughly saturated with water, this method results in maximum volumes of waste for disposal. Dewatering of the overburden is not necessary when overburden is being stripped, but some dewatering of the unstripped overburden is required during matrix recovery. It is necessary to lower the dredge pond level to accommodate the working length of the ladder and mine the entire matrix thickness.

2.1.2.3 Technical Considerations

The unique feature of the dredge is its ability to mine materials submerged in water. Most dredges are electric-powered and perform well when mining unconsolidated, sandy material.

Unlike dragline operations, dredging does not allow the operator to visually observe the phosphate matrix/bedrock contact. Therefore, detailed mapping of the matrix horizon contacts is required to ensure maximum recovery and to avoid dilution of the phosphate matrix.

2.1.3 Bucket Wheel Excavation

2.1.3.1 System Description

Bucket wheel excavators are not presently employed in the central Florida phosphate district; however, they have been considered by most mining companies as alternatives to draglines. A BWE is a large, rotating wheel with a number of fixed buckets on its periphery which excavate the overburden and matrix. The material is discharged to an attached belt conveyor system that can, in turn, discharge to belt conveyors, trucks, or other haulage systems. Generally, BWEs are equipped with crawlers to give better mobility and allow continuous use on various working levels.

Selecting a BWE requires consideration of several complex factors. Unlike draglines, BWE design must be based on specific project operating standards to meet production requirements. Mining of MCC's Hardee County phosphate deposit would require a total of four BWEs. The BWEs would be paired; one excavator would strip overburden while the other would excavate matrix.

2.1.3.2 Environmental Considerations

Bucket wheel excavators consume more energy than draglines when used in the type material encountered on the MCC property. It is also necessary for the pit to be kept dry during operation. This is not an easy task during the rainy summer months. The BWE's allow efficient leach zone management and complete recovery of the phosphate ore.

2.1.3.3 Technical Considerations

Bucket wheel excavators can dig materials such as hard phosphate, sandstone overburden, and bauxite that other equipment cannot handle without prior blasting. They use more energy than draglines due to the need for accessory conveyors to transport mined material out of the pit. However, as harder material is encountered, draglines become more energy-intensive, thus lessening the energy advantage of the dragline. Since the overburden and ore in the proposed mining area are not very hard, the hard material advantage of BWEs is not very important. The BWE equipment can provide leach zone management and closely controlled selective mining in interbedded ore and overburden zones, resulting in good ore recovery.

Among the BWE's disadvantages is its requirement for a completely dry pit. Since the BWE works in the pit, a high wall failure could damage equipment and injure miners. This method does not have the degree of flexibility for discarding waste materials as does the dragline method. Also, there is a relatively high initial capital cost.

2.1.4 Summary

Draglines are considered the most preferable mining method from an environmental standpoint. Both draglines and bucketwheel excavators will remove essentially all of the phosphate matrix. Both require dewatering of the mine cut, but this is most critical with the BWE. The dragline is the most energy efficient of the three methods.

The dredge system has the lowest energy efficiency, highest water consumption, and creates the largest volumes of clay wastes.

TABLE 2.0-1

PROJECT ALTERNATIVES

Page 1 of 2

1. Mining Method
   a. Dragline (Proposed by MCC)
   b. Dredge
   c. Bucket Wheel Excavation

2. Plant Site Location
   a. Vandolah Location (Proposed by MCC)
   b. Centroid of Phosphate Ore Processing
   c. Centroid of Mining and Waste Disposal

3. Matrix Transport
   a. Slurry Pipeline (Proposed by MCC)
   b. Conveyor Belt
   c. Trucking

4. Ore Processing
   a. Wet Process Beneficiation (Proposed by MCC)
   b. Dry Separation
   c. Direct Acidulation

5. Process Water Sources
   a. Surface Water
   b. Ground Water
   c. Combination of Surface and Ground Water (Proposed by MCC)

6. Liquid Effluent Disposal Alternatives
   a. Surface Water Discharge (Proposed by MCC)
   b. Ground Water Discharge

7. Rock Drying
   a. Rock Dryer at Ona (Proposed by MCC)
   b. Rock Dryer at Chemical Plant
   c. No Rock Dryer

8. Waste Disposal
   a. Conventional Method
   b. Sand/Clay Mixing Method
   c. Conventional Disposal Plus Sand/Clay Capping (Proposed by MCC)

9. Reclamation
   a. Conventional Method
   b. Sand/Clay Mixing Method
   c. Conventional Method with Sand/Clay Capping (Proposed by MCC)

TABLE 2.0-1 (Continued) Page 2 of 2

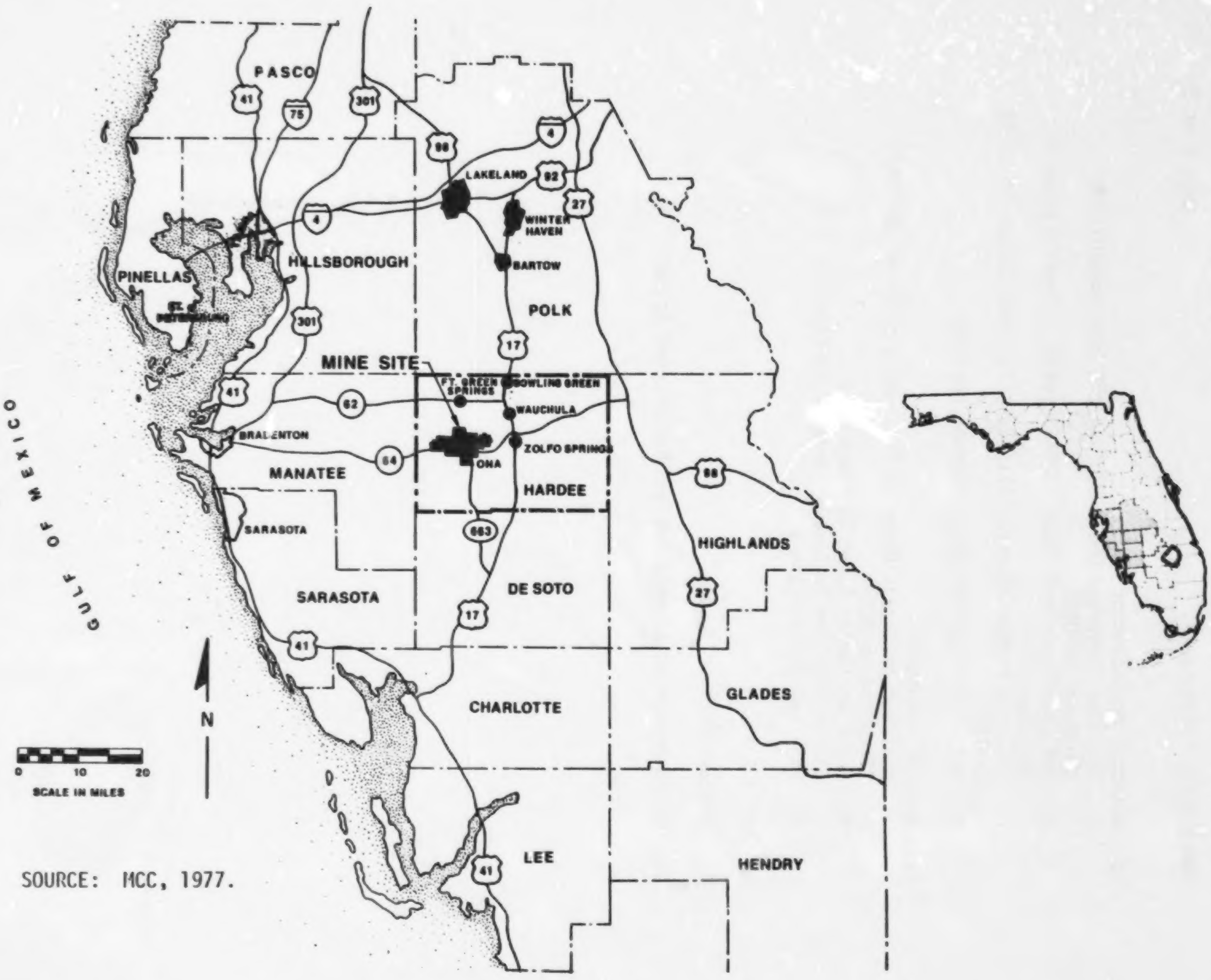
10. Wetlands Preservation
    a. Wetlands Preserved Under Florida DER Development Order (Proposed by MCC)
    b. Wetlands Preserved Under USEPA Areawide Categorization of Wetlands
    c. Wetlands Preserved Under Site-Specific Application of USEPA Criteria
    d. Wetlands Preserved Under Systems Approach

11. Product Transport
    a. Railroad to Tampa; Barge to Pascagoula or Other Customer (Proposed by MCC)
    b. Truck to Tampa; Barge to Pascagoula
    c. Slurry Pipeline to Tampa; Barge to Pascagoula
    d. Railroad to Pascagoula

12. No Action

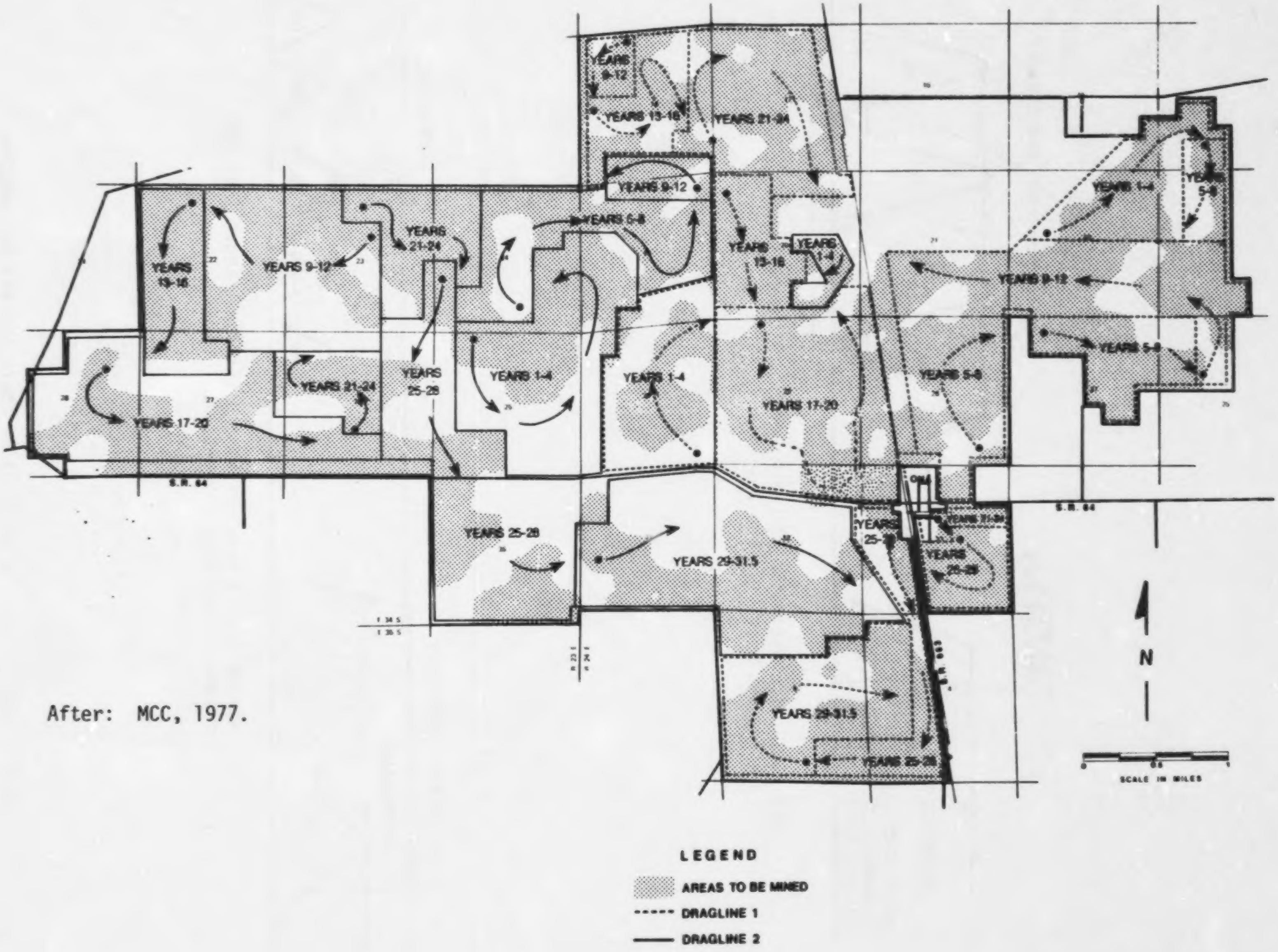
13. Postponement of Action

14. USEPA Preferred Alternative and Recommended Action


PASCO
HILLSBOROUGH
PINELLAS
ST. PETERSBURG
POLK
LAKELAND
WINTER HAVEN
BARTOW
MINE SITE
FT. GREEN SPRINGS
BOWLING GREEN
WAUCHULA
ZOLFO SPRINGS
ONA
HARDEE
BRADENTON
MANATEE
SARASOTA
SARASOTA
DE SOTO
HIGHLANDS
CHARLOTTE
GLADES
LEE
HENDRY
GULF OF MEXICO
41
75
301
98
4
92
27
17
62
64
663
N
0
10
20
SCALE IN MILES

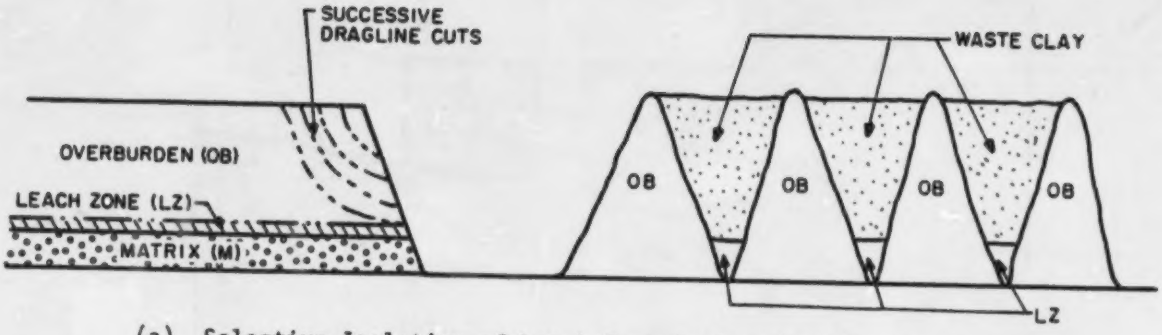
SOURCE: MCC, 1977.

Figure 2.0-1. MCC Mine Site Location.

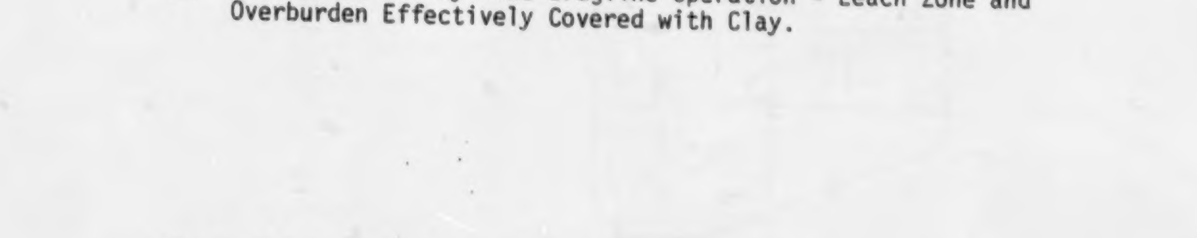

YEARS 9-12
YEARS 13-16
YEARS 21-24
YEARS 9-12
YEARS 5-8
YEARS 13-16
YEARS 1-4
YEARS 1-4
YEARS 5-8
YEARS 9-12
YEARS 5-8
YEARS 5-8
YEARS 13-16
YEARS 9-12
YEARS 21-24
YEARS 25-28
YEARS 1-4
YEARS 1-4
YEARS 17-20
YEARS 21-24
YEARS 17-20
S.R. 64
S.R. 64
YEARS 25-28
YEARS 29-31.5
YEARS 25-28
YEARS 21-24
YEARS 29-31.5
YEARS 25-28
YEARS 29-31.5
YEARS 25-28
N
0
0.5
1
SCALE IN MILES
LEGEND
▨ AREAS TO BE MINED
----- DRAGLINE 1
—— DRAGLINE 2

After: MCC, 1977.

Figure 2.0-2. Mining Unit Sequence


SUCCESSIVE DRAGLINE CUTS
WASTE CLAY
OVERBURDEN (OB)
LEACH ZONE (LZ)
MATRIX (M)
OB
OB
OB
OB
LZ

(a) Selective Isolation of Leach Zone in Standard Florida Phosphate Mine Dragline Operation.


ILL-DEFINED LEACH ZONE
WASTE CLAY
OVERBURDEN
MATRIX
OB
OB
OB
OB
OB

(b) MCC Hardee County Mine Dragline Operation - Leach Zone and Overburden Effectively Covered with Clay.

Figure 2.1-1. Schematic of Dragline Operation and Reclamation Cross-Section for Hardee County Mine and Typical Florida Phosphate Mine.

2.2 PLANT SITE LOCATION

2.2.1 Site Description and Technical Considerations

Major elements in the plant area include the washer, feed preparation, feed storage, reagent storage, flotation section, and wet rock storage. Support facilities and product shipment facilities located at the plant site include the plant office, maintenance and utility area, rock dryer and fuel oil storage, dry rock silos, load out area and railroad sidings. These beneficiation and supporting facilities require 160 acres of land.

The conceptual layout of the MCC plant facilities is shown on Figure 2.2-1. A number of variables must be considered when locating the beneficiation site for mining operations. These variables must be carefully weighed, and a compromise which considers the following elements must be reached:

- Minimization of the loss of phosphate resources under the plant location;
- Minimization of the cost and consumption of energy required for movement of water, ore, and waste products;
- Minimization of the extent and cost of transportation and power to and from the plant site. This includes items such as railroads and the existing transportation network (for goods, services, product, and workers);
- Minimization of the destruction of environmentally sensitive areas.

Consideration of the above elements resulted in three potential plant sites identified as the following and shown on Figure 2.2-2:

- Vandolah Site - NE corner of Section 20, T34S, R24E
- Centroid of phosphate ore processing - SW corner of Section 30, T34S, R24E;

- Centroid of waste disposal and mining - SW corner of Section 20, T34S, R24E;

2.2.1.1 Vandolah Location (Proposed by MCC)

An unmineable tract of land along the Fort Green - Ona Road just west of the north-south rail line was considered for plant site location (Figure 2.2-2).

This site is in close proximity to existing rail lines and roadways, thereby minimizing the expense and loss of reserves associated with the construction of these facilities. Ground water supply wells are nearby, the site is close to the first waste disposal area (MC-1), and it is less than one mile from the ore and waste transportation centroid (Figure 2.2-2). Thus, energy consumption for material transportation is not substantially higher than that expected for plant location at the ore and waste transportation centroid.

The most significant drawback to the use of this site is the considerable distance between it and the surface water reservoir on Brushy Creek.

2.2.1.2 Centroid of Phosphate Ore Processing

Mining companies generally locate their plant sites at a point which minimizes the distance that the ore is transported to the plant. This point is known as the ore centroid. The ore centroid for the proposed site was calculated as a point in the northeast corner of Section 30, T34S, R24E (Figure 2.2-2). A major east-west highway, SR 64, runs near the area.

There are also disadvantages associated with using this site for location of the MCC beneficiation plant. First, it is a considerable distance from the north-south rail line and will require construction of approximately 2 miles of rail track. The rail line would cross Oak Creek, thereby requiring the construction of creek crossings. Phosphate reserves located under the railroad would not be recoverable.

Another disadvantage is that the ground water supply is a considerable distance from this proposed plant location.

2.2.1.3 Centroid of Mining and Waste Disposal

A point in the southwest corner of Section 20, T34S, R24E (Figure 2.2-2) was identified as the optimal site for the beneficiation plant when both waste and ore transportation requirements were considered. Technical advantages associated with this plant site location include reduced energy consumption and reduced transportation of ore and waste (including capital and operating costs).

Among the disadvantages related to the use of the mining and waste disposal centroid for plant site location is the necessity for shifting the plant slightly southwest of the optimal location onto unmineable lands; this would be necessary to minimize the loss of phosphate reserves. In addition, plant construction at this centroid would require both rail and roadway construction, resulting not only in increased construction expenses, but also a loss of phosphate reserves. In addition to these disadvantages, relocation of the waste disposal areas would be required if this centroid were selected for the plant site. While this centroid is closer to the ground water supply wells than the ore processing centroid, it would still be necessary to transport well water approximately one mile to the plant site.

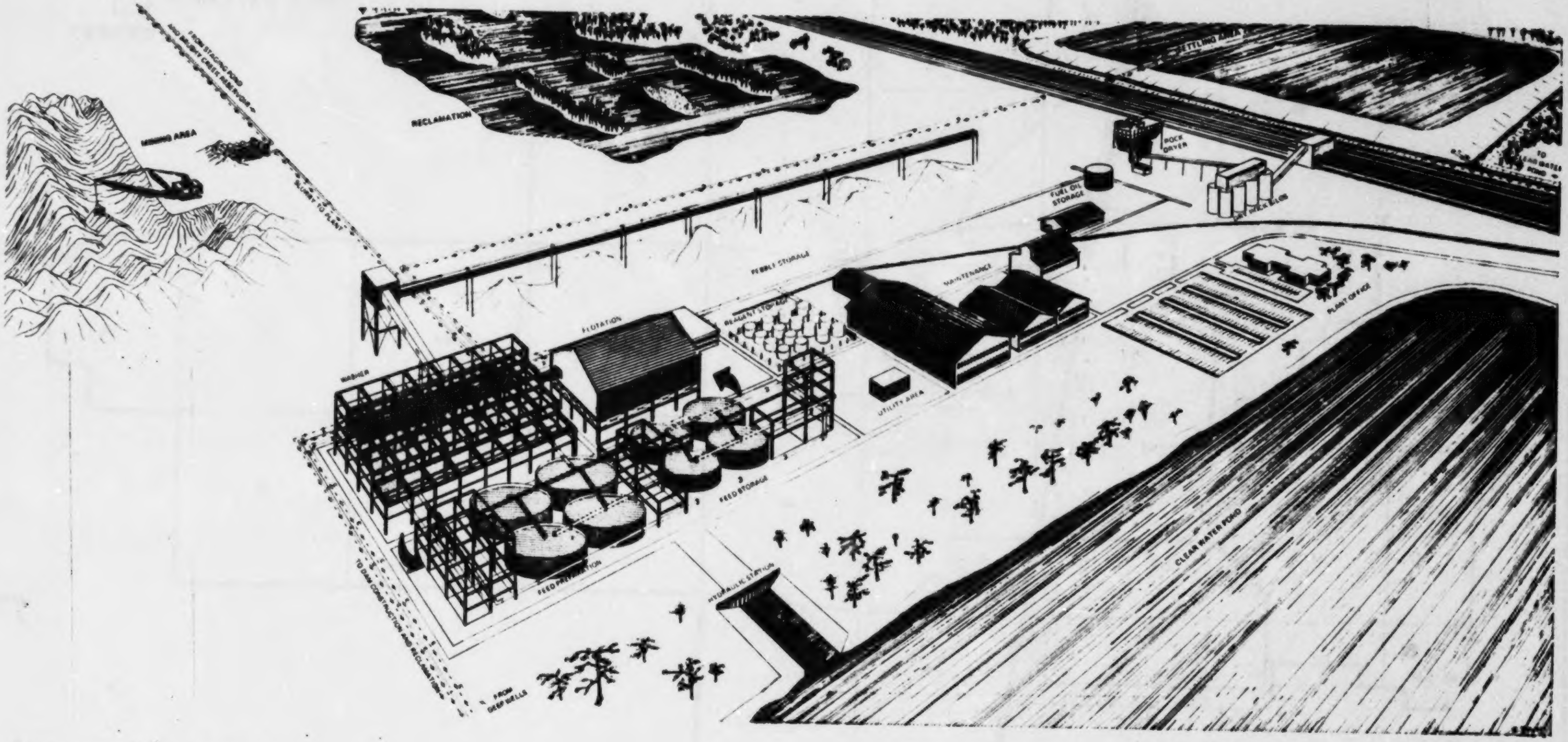
2.2.2 Environmental Considerations

There are no particular environmental advantages or disadvantages associated with locating the plant at any of the sites considered. Each of the alternative sites would ultimately be disturbed either as a result of mining activities (waste disposal and mining centroid sites) or waste disposal (Vandolah site) if the plant were located elsewhere.

2.2.3 Summary

There is no substantial difference in environmental effects associated with the three candidate plant site locations. The proposed

(Vandolah) site requires minimum construction of rail lines and roadways and is close to the ground water wells. Energy consumption from ore and waste transport would be slightly higher, and the surface water source would be considerably distant. The ore centroid location would require construction of a 2-mile rail line (with associated phosphate reserve losses) across Oak Creek and is a considerable distance from ground water supplies. Finally, the centroid of both waste and ore transportation locations would minimize energy consumption. However, it would be necessary to construct rail and roadways; waste disposal sites would have to be relocated; and ground water would have to be pumped approximately one mile.


FROM STAGING POND AND BRIGHT CREEK RESERVOIR
MINING AREA
SLURRY TO PLANT
RECLAMATION
SETTLING AREA
ROCK DRYER
TO CLEAR WATER POND
FUEL OIL STORAGE
DRY ROCK BINS
PEBBLE STORAGE
MAINTENANCE
PLANT OFFICE
WASHER
FLOTATION
REAGENT STORAGE
UTILITY AREA
FEED STORAGE
FEED PREPARATION
HYDRAULIC STATION
CLEAR WATER POND
TO DAM CONSTRUCTION AND RECLAMATION
FROM DEEP WELLS

Source: MCC, 1977.

Figure 2.2-1. Conceptual Plant Lay-Out

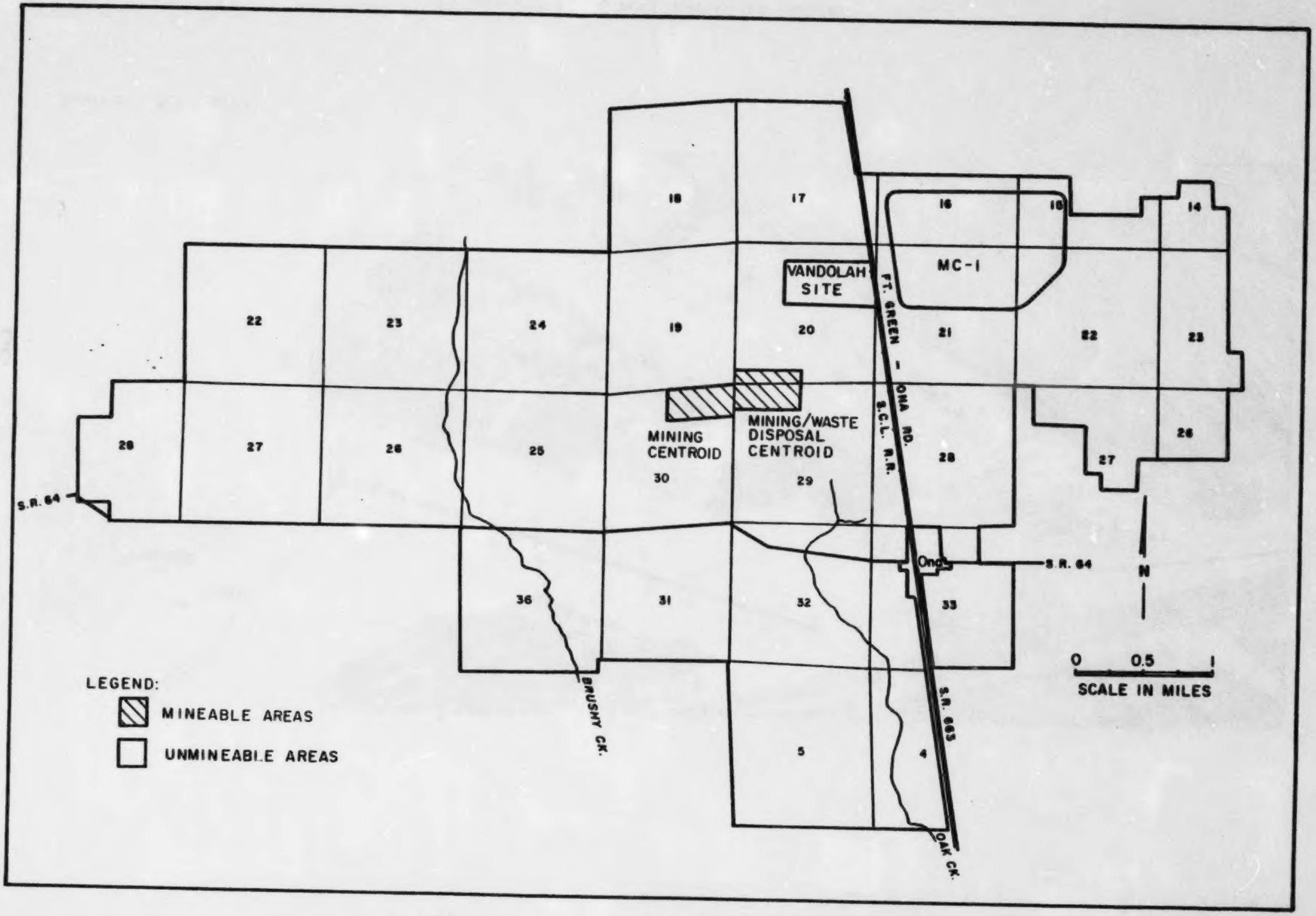

18
17
16
18
14
22
23
24
19
20
21
22
23
VANDOLAH SITE
MC-I
FT. GREEN – ONA RD.
S.C.L. R.R.
MINING CENTROID
MINING/WASTE DISPOSAL CENTROID
28
27
26
25
30
29
28
27
26
S.R. 64
36
31
32
33
Ona
S.R. 64
N
0 0.5 1
SCALE IN MILES
BRUSHY CK.
5
4
S.R. 663
OAK CK.
LEGEND:
MINEABLE AREAS
UNMINEABLE AREAS

Figure 2.2-2. Alternative Plant Site Locations.

2.3 MATRIX TRANSPORT

After the matrix is exposed and excavated, it must be transferred to the beneficiation plant. Because of the large volume of material that must be moved, all methods of transporting the matrix to the plant area are energy intensive. The transport method used should have minimal effect on the environment and relatively low cost. Alternative methods of transporting the matrix from the mine to the beneficiation plant which were evaluated for use at the proposed MCC mine are slurry pipeline, conveyor, and truck.

2.3.1 Slurry Pipeline (Proposed by MCC)

2.3.1.1 System Description

The pipeline matrix transportation system is currently being used in all but one phosphate mining operation in the central Florida district. In this system, the excavated matrix is stacked at natural ground level outside the cutline and dumped into a slurry pit or "well." Hydraulic guns break up and slurrify the matrix to a pumpable mixture. Grizzlies prevent oversize rocks and other material from entering the pit pump. The matrix slurry is pumped through pipelines to the beneficiation plant. Slurry may be pumped distances up to 6 miles.

MCC's matrix transportation would require two independent pipeline systems which would extend from each of MCC's two mining locations to the beneficiation plant. Both pipeline systems would be similar to those presently in use elsewhere in the central Florida phosphate district and would consist of a slurrification pit, slurrification pit guns, a grizzly screen, a pit pump, booster pumps, and the actual pipeline. The slurrification pit would be approximately 150 feet in diameter, with the pit guns located at the pit discharge just before the point where the matrix enters the pipeline. The pit pump would initiate the matrix transfer process by "lifting" the matrix out of the slurrification pit into the pipeline. The matrix pipeline would be approximately 20 inches in diameter and would have booster pumps spaced approximately 3/4 mile apart along its length. The locations of the matrix booster pumps would vary due to the size and availability of the individual pumps to be used and the topography of the transportation route.

2.3.1.2 Environmental Considerations

Vegetation would be removed and wildlife disturbed along a narrow strip of land where the transport system is situated.

The pipeline system is energy intensive in that slurry water would be added to the matrix, and the mixture would then be transported to the beneficiation plant. However, the high energy consumption would be offset somewhat by the lack of secondary handling requirements such as that needed for a conveyor system.

Matrix transported in a slurry system would be closed to the atmosphere and, consequently, would not be a source of air pollutants. Therefore, air pollution equipment would not be needed in a hydraulic transportation system, and the energy required to operate such equipment would be saved.

Pipeline or pump failure could result in spillage of the matrix slurry. However, the possibility of this occurrence is minimized in the phosphate industry through the use of operation and preventive maintenance practices (such as pipeline inspection and rotation, low pressure shutoff system; stand pipes) and implementation of safeguards which meet or exceed state regulatory guidelines (Florida Administrative Code, Chapter 17-9).

2.3.1.3 Technical Considerations

Hydraulic transportation can move large volumes of matrix over adverse ground conditions; slurry pumping aids in the disaggregation of the matrix prior to its arrival at the washer system. It is a highly mobile system which can be readily adapted to the frequent changes in mine locations and is not sensitive to weather conditions. Finally, slurry pumping systems are a proven technology with which the industry has substantial experience and capability to handle problems which may arise in the field.

Initial pipeline slurry water for MCC operations would be obtained from both ground water and surface water sources. Less than 5 percent of the start-up slurry water volume (which is 142 MGD, see Figure 2.5-1) would be required during normal operations to make up evaporative water losses.

2.3.2 Conveyor Belt

2.3.2.1 System Description

In recent years, conveyor systems have been considered by most phosphate mining companies as an alternative method for matrix transport. Presently, one phosphate company in Florida is using a conveyor belt system, but this system has not been totally successful to date.

A conveyor belt is an arrangement of mechanical components which supports and propels the belt that, in turn, carries the bulk material being transported. It is a system designed for continuous transportation of bulk material and, if the matrix ore can be loaded at a uniform rate and the total quantity of matrix to be transported justifies this system, it can be the most economical and energy efficient system to operate.

As with pipeline matrix transport, two independent conveyor systems would be required to transfer the matrix from MCC's two mining areas to the beneficiation plant. To transport the required amount of matrix from the mining areas to the beneficiation area, 36-inch wide conveyor systems would be utilized.

2.3.2.2 Environmental Considerations

The impacts of the conveyor transport system are similar to those described in Section 2.3.1.2 for pipeline systems except that slurry water is not required for conveyor transport. In addition, conveyor transport requires dewatering of the matrix prior to transportation. Transfer points along the conveyor route would be sources of fugitive emissions of dust which would have local effects on air quality.

2.3.2.3 Technical Considerations

The design of a conveyor belt system for a specific use requires consideration of such basic factors as: the characteristics of the material to be conveyed (density, lump size, fines, condition, particle shape), the rate of transport, and the necessity of handling the material at different rates. Generally, the characteristics of the material to be transported must remain constant. To ensure this, the matrix must be handled twice at the mine area: once from the mining unit to a screening/dewatering unit and then to the conveyor system for transport.

A further development related to the conveyor system transport which is being studied involves desliming and scalping the matrix prior to transport. The matrix would be transported to a small washing plant where the oversized material would be crushed and passed through cyclones and screw classifiers for dewatering prior to loading on the belt. Waste from the cyclone overflow would be directed to waste or reclamation fill areas.

Because the matrix must be dewatered and remain "dry" (70 to 80 percent solids) during transport, the conveyor system should be enclosed. Once enclosed, the system would not be sensitive to precipitation and would provide effective control of fugitive dust emissions.

Conveyor systems are not as mobile as pipeline systems, and the capital and maintenance costs far exceed that of a pipeline system.

2.3.3 Trucking

Trucks have been used to a limited extent as a method of hauling phosphate ore from the mine to the beneficiation plant in central Florida phosphate mining operations. Truck haulage has been restricted to some of the "debris" processing operations, which involve the remining of waste tailings from earlier mining activities. There has been no major utilization of truck haulage to transport in-situ phosphate ore from mine to plant in the central Florida phosphate district. Successful truck haulage is generally confined to areas of the western United States where ore moisture content in mining operations is very low.

2.3.3.1 System Description

In order to keep energy consumption to a minimum, the tractor-trailer haulage truck with its lower energy to tonnage hauled ratio was chosen for illustrative purposes to evaluate this transportation alternative. Most grades and slopes which could be expected in mining the MCC tract are flat enough that the tractor trailer truck could be used.

Projected annual processing schedules would require that 1,100 cubic yards per hour per mine site (two mining sites proposed) be delivered to the plant. Based on 75 percent availability, this equates to four operating front end loaders, two at each mine site to load the trucks, and 16 trucks operating at approximately 70 tons per truck per trip.

In addition to loading and haulage equipment, a facility to unload and feed the phosphate ore into the washer/beneficiation plant would be required.

2.3.3.2 Environmental Considerations

The impacts from utilizing a trucking operation for transporting the ore would include disturbance of vegetation and wildlife due to the required road construction; emission of fugitive dust from the mine roads and the ore itself during truck haulage; noise and exhaust emissions; and, most likely, a higher overall energy consumption than the other transportation methods. Much of the energy consumed by truck transportation is not used for productive purposes since the trucks must return to the mine empty.

2.3.3.3 Technical Considerations

Truck haulage methods could be employed with either the dragline or BWE mining methods, but truck usage is not considered practical for use in the dredge mining method. The ore in the dredge method would be in a slurry state and would require dewatering prior to loading on trucks, an additional expense in the handling/processing procedure.

The primary advantage of the hauling truck as a material handling method is its extreme versatility. In open mines, this is particularly important as dozens of production centers may be located throughout the mine, producing a number of different materials or grades of materials. An additional advantage of truck haulage is the ability of trucks to climb grades of up to 10 percent.

Disadvantages of the truck haulage approach are: 1) the large haulage trucks require the construction and maintenance of high quality roads, which would be a difficult task in the summer months due to the chacteristically high water table; 2) difficulty in dumping and unloading operations due to the wet clayey (or sticky) condition of the phosphate ore; 3) the requirement for additional equipment to load the trucks at the mine; 4) the costliness of maintaining a fleet of trucks (capital cost, labor, maintenance, tires, fuel); 5) the necessity for slurrifying the ore at the washer for processing so that there would be no water consumption advantage over other transportation methods; and 6) the increased potential for fugitive dust emissions from the mine roads, requiring additional oiling and wetting to control these emissions.

Truck haulage would also eliminate an important benefit derived from slurry pipeline transportation. The process of pumping the ore through a pipeline results in a "scrubbing" of the particles. This scrubbing improves the beneficiation or processing of the phosphate ore in several ways. There is an improved disaggregation of the clay coating from the phosphate particles. This action results in an improved metallurgical performance in the plant: reagent consumption is reduced, and there is improved recovery at higher grades of phosphate.

2.3.4 Summary

Conveyors would be the most environmentally acceptable method of matrix transport. Less energy would be necessary for materials handling. Also, there is less chance for pipeline rupture than with slurry transport. Truck transport would be very energy intensive and would reduce substantial fugitive dust from the roadways.

From a technical and cost standpoint, however, slurry pipelines provide the least expensive (substantially so), most flexible, and most proven method of matrix transport. Water usage is actually high only during system startup, as 95 percent is recycled during normal operations.

2.4 ORE PROCESSING

Processing is the application of beneficiation techniques to the matrix after it is mined and transported to the plant area. At the plant, the phosphate is separated from waste materials such as quartz sands and clays, thus upgrading the phosphate. Three systems for beneficiation of the phosphate matrix-- wet processing (conventional) beneficiation, dry separation, and acidulation--were considered for use at the MCC mine site and are discussed in this section.

2.4.1 Wet Process Beneficiation (Proposed by MCC)

2.4.1.1 System Description

Wet processing beneficiation is presently employed throughout the central Florida phosphate district. This system is most suitably adapted to the pipeline system of matrix transportation. The major components of the wet processing beneficiation system are the washer section, feed preparation area, and flotation plant. Slurrified matrix is transported to the washer where the pebble product is separated from the waste clays and feed. The waste clays are routed to disposal areas, and the feed is sized at the feed preparation area. The sized feed is then processed at the flotation plant where the concentrate product is separated from tailings sand. The tailings sand is pumped away from the flotation plant and is generally used as fill material in reclamation projects or as construction material for dams. The pebble and concentrate products are usually stockpiled on ground adjacent to the beneficiation area until they are required to meet sales commitments.

Washing Facilities

When the matrix is received at the washer, it consists of phosphate gravel, phosphate grains, clay balls, clay, and quartz sand. The washer separates the matrix into three components, based on particle size: 1) phosphate gravel, which is commonly known as pebble, 2) sand-sized phosphatic and quartz grains commonly known as feed, and 3) finesized waste clays.

The washer has three major units: 1) the matrix scalping section, 2) the washing/screening section, and 3) the desliming section (Figure 2.4-1). Using a series of rotary trommel screens, the matrix scalping section separates oversized material and clay balls from the matrix. The oversized material is disintegrated by a bank of hammer mills, and then it is recycled through the scalping section. Before leaving the scalping section, the matrix is normally reduced to particles ranging in size from less than 1 millimeter (mm) to 19mm.

After the matrix is "sized" at the scalping section, it is routed to the washing/screening section where the pebble (1mm to 19 mm size material) is separated from the feed and waste clays (less than 1mm size material). Flat vibrating screens and/or hydraulic sizers are utilized in the primary separation process. The pebble is then routed through log washers and a final series of vibrating screens which facilitates further separation of feed and waste clays from the pebble. Pebble beneficiation is complete at this point. The pebble product is transported away from the washer by a conveyor belt system to a stockpile or is loaded directly into railroad cars for shipment.

Feed and waste clays are routed to the desliming section where they are separated by hydro-cyclones. Feed generally ranges in size from 1mm to 0.1mm, and waste clays comprise the less than 0.1mm size fraction. The waste clays are pumped and/or allowed to flow by gravity away from the washer area. The feed is routed to the feed preparation area or stockpiled until required for further processing.

Feed Preparation

Figure 2.4-2 identifies the steps followed in the feed preparation area. The feed is received from the desliming area and/or the feed storage area and is separated into fine and coarse feed at the feed preparation facility. Coarse feed is that fraction which is greater than 0.5mm, and fine feed is less than 0.5mm. Rake classifiers, screw classifiers, and hydrosizers are generally used to accomplish feed sizing.

Flotation

Coarse feed and fine feed are sometimes subjected to different concentrate recovery processes, both of which require initial treatment of the feed with conditioners. The coarse feed may be routed to either spiral or flotation circuits where the coarse concentrate is separated from the sand tailings. Flotation cells are utilized to separate the fine concentrate from the sand tailings. Figure 2.4-2 depicts the flotation process.

Waste Products

The waste products produced from the beneficiation of phosphate are quartz sand tailings and clays. Generally, sand tailings are pumped to disposal sites. Whenever possible, a gravity-flow system is used to transport waste clays away from the beneficiation area. To date, the general method of waste clay disposal has been impoundment in above-ground storage ponds. This type of waste clay disposal has been necessary since clays retain large amounts of water, increasing their volume above that of the mined matrix.

New methods such as various types of sand/clay mixing and chemical thickening of waste clay disposal are presently being evaluated (see Section 2.8). These methods have been tested on a small scale and have been successful, but full scale operations of this nature have not been successful to date. When this new technology is proven, above-ground waste clay containment areas will be minimized.

Wet Rock Storage

After beneficiation, wet rock is loaded from storage by gravity onto conveyor belts or into hopper cars for transfer to a primary wet rock storage facility. There, the hopper cars are unloaded through an overhead trestle or car shaker, and the product falls into a conveyor which transports it to storage piles. The product is dumped, by means of a movable stacker or overhead tripper conveyor, into piles according to size, BPL (bone phosphate lime) grade, I&A (iron and aluminum) content, and other factors. On the storage piles, tractors are used to keep the stackers, conveyors, or trestles clear and to move the material back to the reclaiming facilities. A tunnel extending under the length of the storage piles facilitates rehandling of the wet rock. A conveyor in the tunnel passes the product to wet rock feed bins for storage prior to drying.

2.4.1.2 Environmental Considerations

The primary environmental consideration associated with beneficiation is the above-ground storage of waste clays (see Section 2.8). Although a remote possibility, dam failures pose a potential for significant damage to aquatic ecosystems and degradation of water quality in the receiving water systems. Conventional beneficiation requires less energy than the other alternatives and is less likely to be a source of air pollutants.

2.4.1.3 Technical Considerations

Wet process beneficiation is an operational and, to date, successful method of economical extraction of phosphate product from the mined ore. Water use has improved over the years to a 90 percent recycle level. The main losses occur with entrainment of water in waste clays and evaporation from water bodies. Waste clays are generally stored in above-grade settling areas. Sand tailings, another waste product is disposed of in mine cuts or is used to build retaining dikes for the waste clay storage areas.

2.4.2 Dry Separation

2.4.2.1 System Description

Dry beneficiation of phosphate ore is used principally in arid regions where water is in short supply and the mined ore has low moisture content. It is a method whereby organics and other waste products are removed from the product by differences in specific gravity (air classification). In Florida, the moisture content of the ore ranges from 15 to 25 percent and, to employ dry separation techniques, the ore must be dried.

2.4.2.2 Environmental Considerations

The major environmental concern with beneficiation by the dry separation process is its high rate of energy consumption compared to the other two processes. This process also has a much greater potential for atmospheric emissions of particulate matter than the other methods, but water consumption is lower and the above-grade waste clay storage areas might be eliminated by this method.

2.4.2.3 Technical Considerations

Dry beneficiation has not yet been used in the United States. In areas where it has been employed, this method has been used for removal of carbonates. Dry beneficiation has not been directed at phosphate-quartz separation, which is the process required in Florida.

2.4.3 Direct Acidulation

The direct acidulation process is in the experimental stage, hence no phosphate mining company in the central Florida phosphate district is employing it at present. However, in recent years, most phosphate companies have considered this method as an alternative for matrix processing.

Since this process is in the experimental stages and not in present use in the central Florida phosphate district, a detailed description of the process is not included. A process description (Figure 2.4-3) has been prepared by White and others (1975).

2.4.3.1 System Description

In this process, direct digestion of the matrix with sulfuric acid is used to recover the phosphate as phosphoric acid. Initially, the matrix must be ground to a fine particle size to achieve the proper dissolution. Before the matrix is ground, it must be dewatered by a dryer to promote efficient grinding and to prevent dilution of the phosphoric acid. During this process, a filtration system is utilized to remove gypsum, clay, silica, and other acid-insoluble waste materials.

2.4.3.2 Environmental Considerations

The primary environmental concern for beneficiation by the direct acidulation process is the potential for significant negative impacts on local air and water quality. As with the dry process, the matrix must be dried and ground. Also, the extensive utilization of sulfuric acid in this process results in a potential for acid emission into the atmosphere and the receiving surface waters.

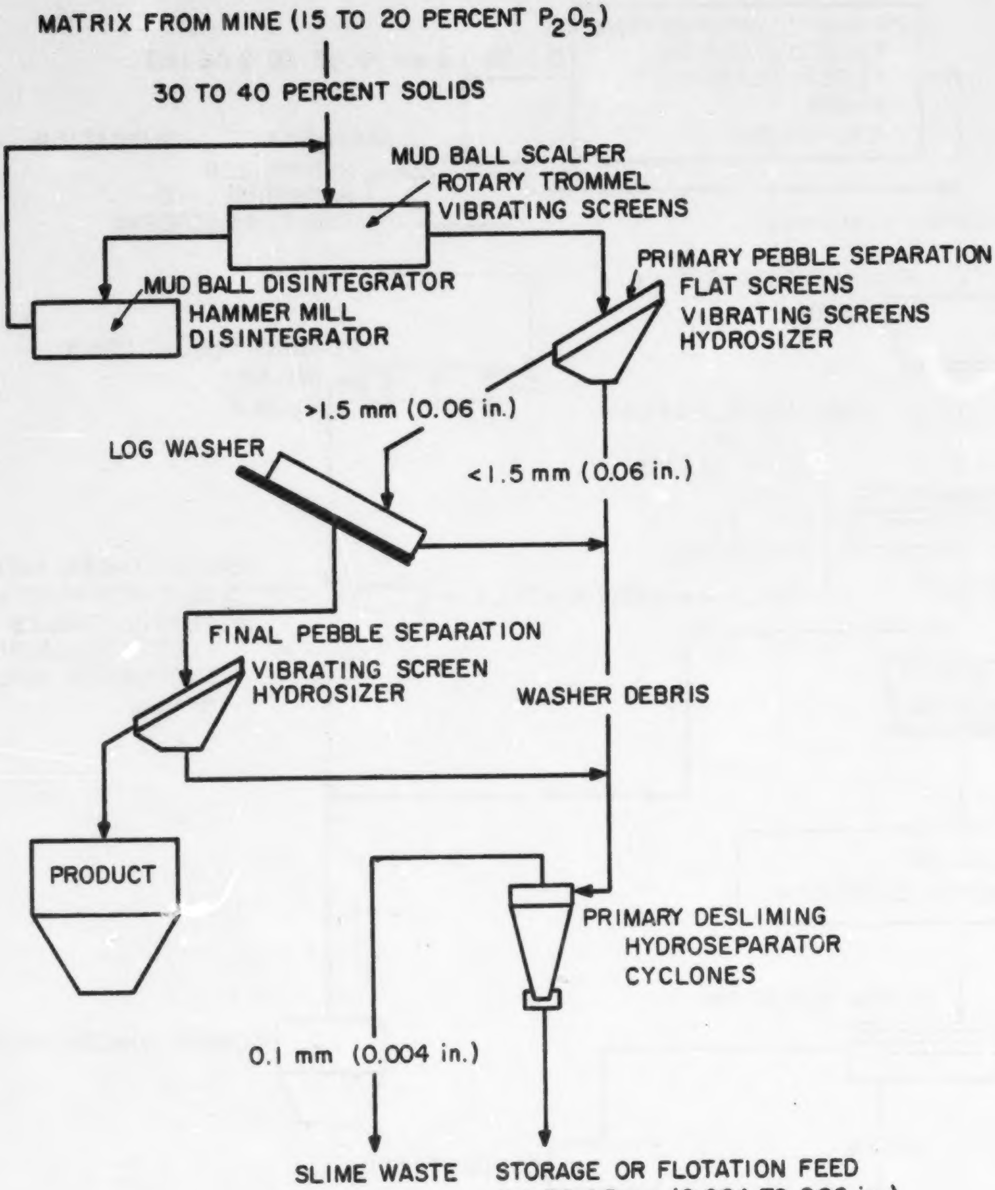
2.4.3.3 Technical Considerations

Since the direct acidulation process is in the experimental stage, little is known about product recovery and operational difficulties on a large-scale basis. Operational costs are expected to be high due to the matrix drying requirements and sulfuric acid consumption ratio. Sulfuric acid consumption rates are estimated to be much greater than those of conventional beneficiation because of reactions of the acid with calcium and magnesium which are contained in the matrix.

2.4.4 Summary

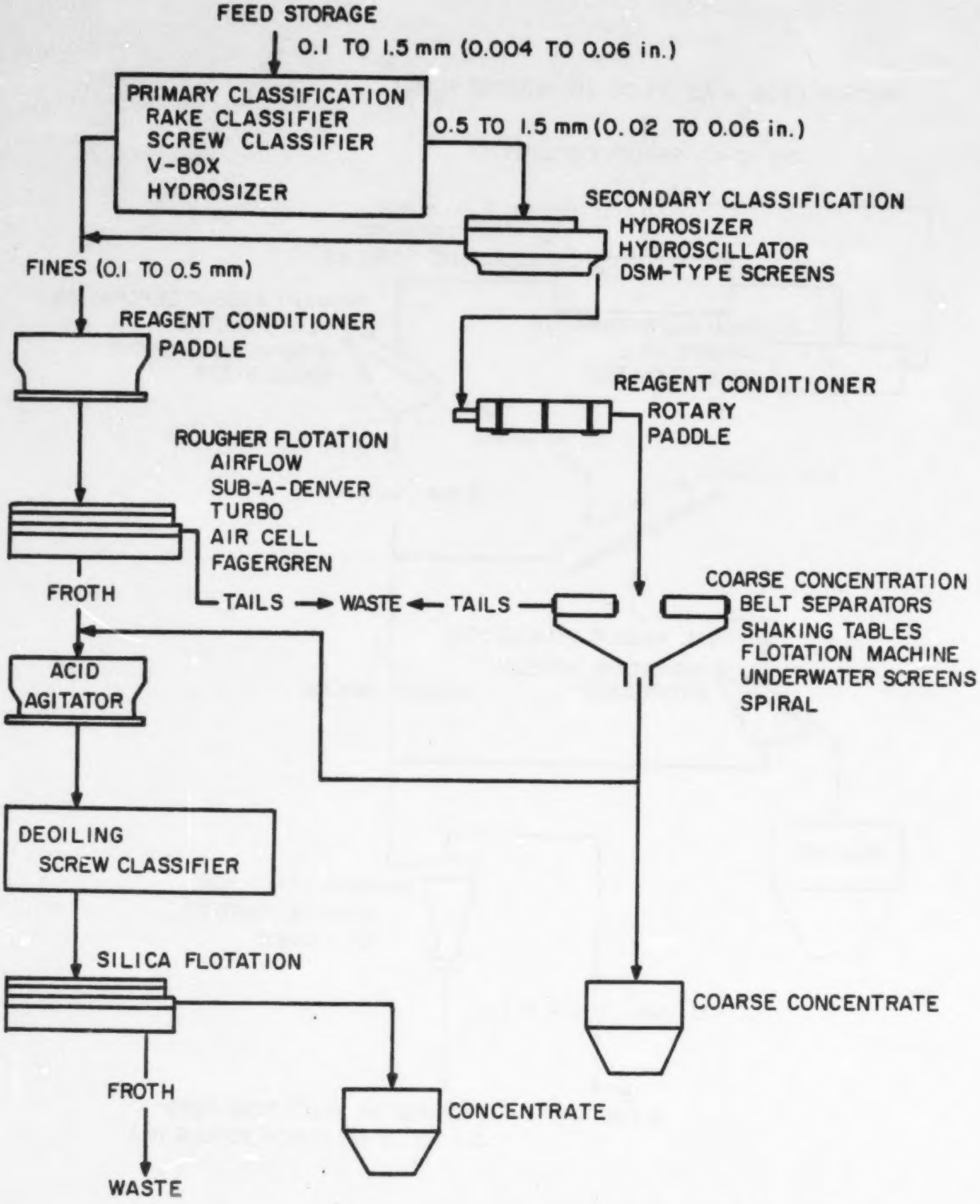
Wet process beneficiation is considered the environmentally preferred method of ore processing. Most water used in the process is recycled for further use. Atmospheric emissions and energy use are relatively low. Adverse impacts include the need for above-ground storage of waste clays and the potential for dam failure.

Dry beneficiation would require substantial use of fuel oil (or other energy sources) to dry the entire matrix (not just the concentrated phosphate rock as proposed) and, consequently, has the potential for emitting substantial quantities of particulate SO_2 and NO_x. Direct acidulation requires drying and grinding of the ore as well as reaction with sulfuric acid and has all the environmental disadvantages of dry processing. This is also an unproven process, still in the experimental stage. Both dry processing and direct acidulation would eliminate the need for above-ground waste clay disposal.


MATRIX FROM MINE (15 TO 20 PERCENT P_2O_5)
30 TO 40 PERCENT SOLIDS
MUD BALL SCALPER
ROTARY TROMMEL
VIBRATING SCREENS
MUD BALL DISINTEGRATOR
HAMMER MILL
DISINTEGRATOR
PRIMARY PEBBLE SEPARATION
FLAT SCREENS
VIBRATING SCREENS
HYDROSIZER
>1.5 mm (0.06 in.)
LOG WASHER
<1.5 mm (0.06 in.)
FINAL PEBBLE SEPARATION
VIBRATING SCREEN
HYDROSIZER
WASHER DEBRIS
PRODUCT
PRIMARY DESLIMING
HYDROSEPARATOR
CYCLONES
0.1 mm (0.004 in.)
SLIME WASTE
STORAGE OR FLOTATION FEED
0.1 TO 1.5 mm (0.004 TO 0.06 in.)

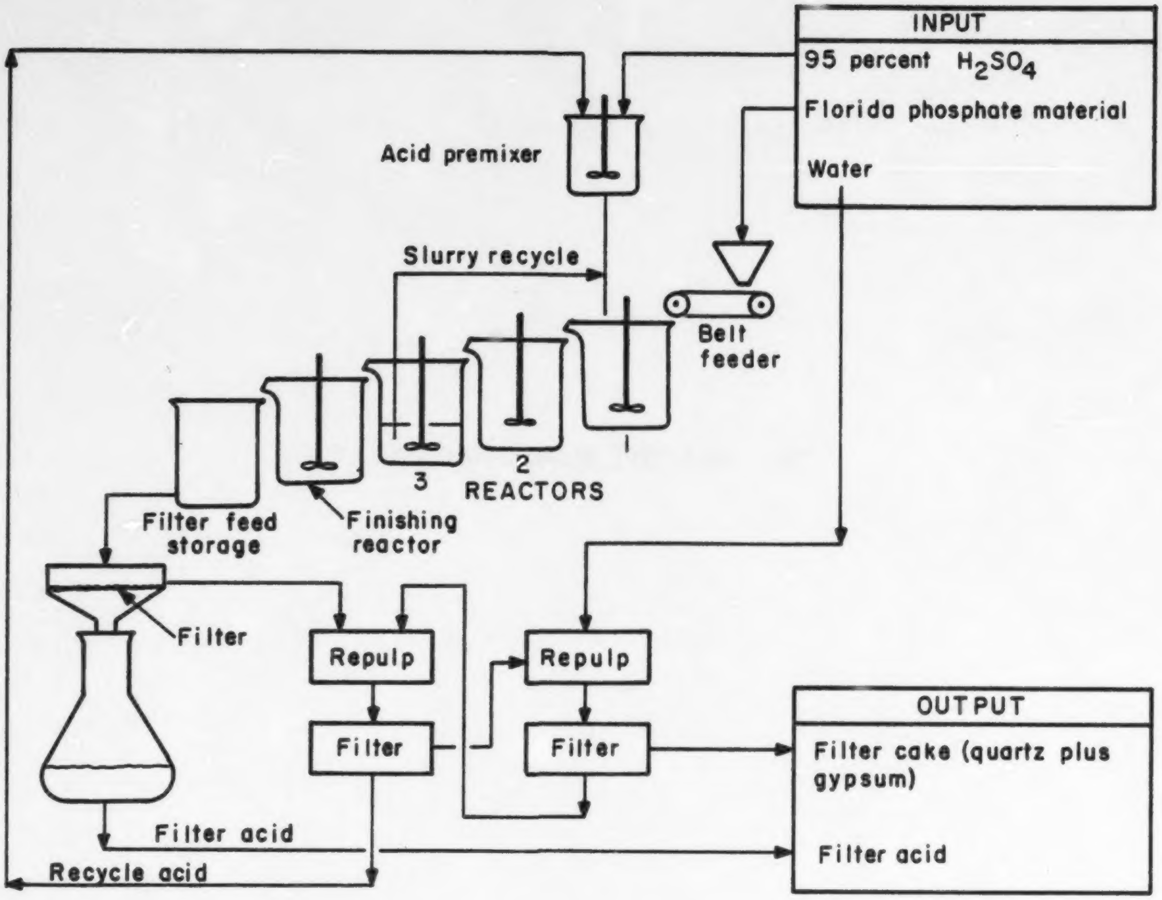
Source: Sweeney and Hasslacher, 1970.

Figure 2.4-1. Generalized Diagram of Washer Plant.


FEED STORAGE
0.1 TO 1.5 mm (0.004 TO 0.06 in.)
PRIMARY CLASSIFICATION
RAKE CLASSIFIER
SCREW CLASSIFIER
V-BOX
HYDROSIZER
0.5 TO 1.5 mm (0.02 TO 0.06 in.)
SECONDARY CLASSIFICATION
HYDROSIZER
HYDROSCILLATOR
DSM-TYPE SCREENS
FINES (0.1 TO 0.5 mm)
REAGENT CONDITIONER
PADDLE
REAGENT CONDITIONER
ROTARY
PADDLE
ROUGHER FLOTATION
AIRFLOW
SUB-A-DENVER
TURBO
AIR CELL
FAGERGREN
FROTH
TAILS
WASTE
TAILS
COARSE CONCENTRATION
BELT SEPARATORS
SHAKING TABLES
FLOTATION MACHINE
UNDERWATER SCREENS
SPIRAL
ACID
AGITATOR
DEOILING
SCREW CLASSIFIER
SILICA FLOTATION
COARSE CONCENTRATE
FROTH
CONCENTRATE
WASTE

Source: Sweeney and Hasslacher, 1970.

Figure 2.4-2. Generalized Diagram of Flotation Plant.


INPUT
95 percent H_2SO_4
Florida phosphate material
Water
Acid premixer
Slurry recycle
Belt feeder
1
2
3
REACTORS
Filter feed storage
Finishing reactor
Filter
Repulp
Filter
Repulp
Filter
OUTPUT
Filter cake (quartz plus gypsum)
Filter acid
Filter acid
Recycle acid

Source: White and others, 1975.

Figure 2.4-3. Sulfuric Acid Digestion of Florida Phosphate Materials.

2.5 PROCESS WATER SOURCES

Water is an important ingredient in the phosphate mining operations in Florida. Water is used as a medium in which to transport ore from the mine site to the plant, to transport the feeds and products through the plant, and to transport the waste products away from the plant to disposal sites.

The competition for water use in Florida for public supplies, industrial use, and agricultural purposes has prompted conservation measures on the part of all water users. Mining and processing of phosphate requires vast quantities of water. Phosphate mines in Florida have responded to the pressures for reduced water consumption by reducing their withdrawals by over 45 percent since 1969. At present, an industry-wide average of approximately 90 percent of the water used in processing the phosphate ore is recycled.

There are three alternatives to consider as sources of water at the MCC site: 1) surface water; 2) ground water; and 3) a combination of both. These three alternatives will be discussed in the following sections.

2.5.1 Source Description and Technical Considerations

2.5.1.1 Surface Water

There are two surface water sources available on the MCC site: the numerous streams crossing the site, and large rainfall catchment areas available after mining commences. MCC plans to divert surface water from Brushy Creek into a proposed off-channel storage basin of about a 9,500 acre-foot capacity (Figure 2.8-1). By the fourth year of mine operations, the Brushy Creek reservoir (BCR) would be completed and would cover about 200 acres with an average depth of about 50 feet. A set of weirs will be placed in Brushy Creek so that water will be diverted into BCR only when streamflow reaches 3.25 cfs.

Surface water on the MCC tract is of very low quality and would not be suitable for use in the wet beneficiation flotation process.

Organic chemicals and suspended solids in the surface water interfere with the reagent precipitation processes. Surface water is usable, however, in other make-up water applications.

The quantity of surface water is variable over the year, generally following the rainfall patterns. In order to protect downstream users, the use of surface water is regulated by the Southwest Florida Water Management District (SWFWMD). SWFWMD will allow only a portion of the stream flow to be removed and used. The portion of the stream flow which can be used is related to the monthly flows and range in flow of the stream.

Inadequate allowable quantities and quality of surface water at the MCC site preclude this as the sole source of water. Total MCC water consumption is estimated at 17,410,000 gpd average annually. The surface water supplies are highly variable and are not adequate for process water quantity, even with the addition of the BCR.

2.5.1.2 Ground Water

There are two major sources of ground water supplies at the MCC site: the surficial water table aquifer and the Floridan aquifer.

The surficial aquifer and upper Floridan aquifer supply water for domestic uses in the project area. Local Hardee County ordinances and SWFWMD regulate the drawdown of the water levels in the aquifers at property boundaries in order to protect adjacent landowners. These regulatory requirements and the low transmissivity of the surficial aquifer are such that MCC cannot develop adequate supplies from the surficial aquifer to meet process water requirements.

The Floridan aquifer is the main source of large volumes of ground water and, as mentioned above, is protected from excessive drawdown by SWFWMD. The Floridan aquifer is capable of supplying the process water requirements for the MCC project.

Advantages to the use of ground water are that the quality is sufficient for flotation needs and the quantity is less sensitive to rainfall variation and, therefore, more dependable. Limitations must be placed on ground water withdrawals, however, to avoid interference with other water users in the area.

2.5.1.3 Combination of Surface and Ground Water (Proposed by MCC)

Because of physical limitations on quality and quantity of surface water and regulatory control of ground water withdrawals, MCC's process water demands cannot be met from a surface water or a ground water source alone. A combination of these sources has been proposed (Figure 2.5-1). A permit has been received from SWFWMD for this proposed system.

The availability of combined surface and ground water sources appears adequate to meet MCC process water requirements. Total process water requirements are approximately 157,400,000 gpd. However, most of this (136,770,000 gpd) is supplied through recirculation. Thus, the actual need is 20,630,000 gpd.

Of this 20,630,000 gpd process water requirement, 3,220,000 gpd is supplied by the water content in the ore. As a result, the net requirement for process water is 17,410,000 gpd. Of this quantity, 10,500,000 gpd must be from ground water supplies to meet flotation quality requirements. This leaves a requirement of 6,910,000 gpd which could be met by either surface or ground water withdrawals. The surface water sources on MCC property are of acceptable quality to meet this demand. However, regulatory requirements, imposed by SWFWMD and based on surface water studies limit withdrawal from the proposed Brushy Creek reservoir to an annual average of 5,086,000 gpd. As a result of this regulatory limitation, the remaining process water requirement of 1,824,000 gpd must come from ground water sources.

To reduce the ground water and surface water withdrawals, MCC proposes to employ rainfall catchment practices. Unfortunately rainfall is not a dependable source in quantity and in timing. Also, because the entire active mine and waste disposal area would serve as

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the catchment basin, the water collected would not be of a quality that could be used in the flotation process.

2.5.2 Environmental Considerations

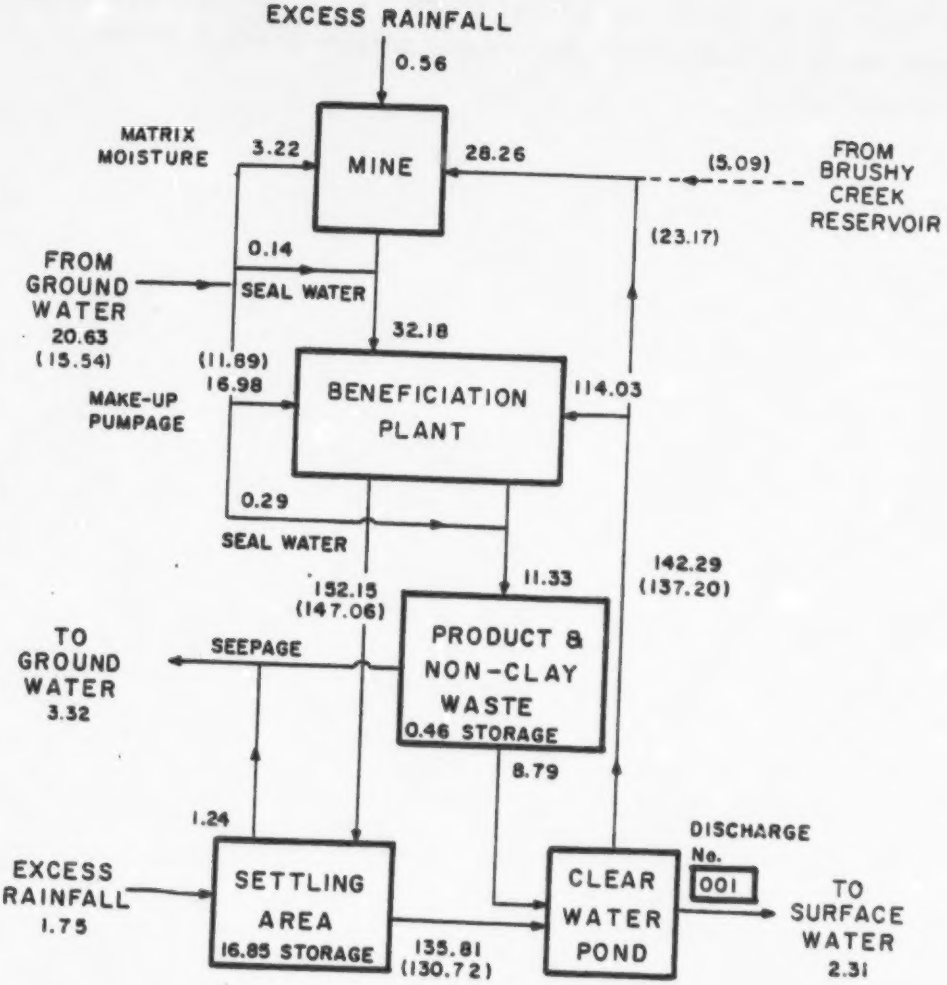
The consumption of water is directly related to the quantity which is entrained in the waste clays. Entrainment is by far the largest source of water consumption, accounting for nearly 80 percent of the process water requirement. Of the 17,410,000 gpd which would be removed from surface and ground water sources, only 14,084,640 gpd would be actually consumed. The remaining 3,325,360 gpd would be returned gradually to the surface and ground water systems through seepage from various product storage and waste disposal areas.

To obtain all of this water from either the surface or ground water source would result in an increase of overall adverse environmental impacts. Withdrawals of this quantity from surface water sources would greatly affect downstream conditions. A similar withdrawal from ground water supplies would increase water level drawdowns and increase the potential for affecting nearby users while adversely affecting the aquifer (see Section 3.2.2).

2.5.3 Summary

The proposal to withdraw approximately 5,086,000 gpd from Brushy Creek Reservoir and 12,324,000 from the Floridan aquifer to meet process water demands is preferred over the alternatives of total withdrawal from either surface or ground water. Sufficient water would be left in Brushy Creek throughout the year, including average monthly minimums, to retain about 75 percent of the present annual flowrate, which should not adversely affect present users. Ground water withdrawals of the proposed magnitude (the full 17,410,000 gpd would be withdrawn from ground water during the first three years of mining) are not expected to lower potentiometric sufaces more than a few feet at the property boundaries (Section 3.2.2.2).

The alternative of withdrawing the full water needs from surface supplies would be unacceptable from both a process water quality standpoint and because nearly all of the annual average flow of Brushy Creek would be required (insufficient flow would be available during portions of the year). Withdrawal of the full requirement from ground water would be feasible but would cause greater drawdown of the Floridan aquifer.



EXCESS RAINFALL
0.56
MATRIX MOISTURE
3.22
MINE
28.26
(5.09)
FROM BRUSHY CREEK RESERVOIR
(23.17)
FROM GROUND WATER
20.63
(15.54)
0.14
SEAL WATER
32.18
(11.89)
16.98
MAKE-UP PUMPAGE
BENEFICIATION PLANT
114.03
0.29
SEAL WATER
152.15
(147.06)
11.33
142.29
(137.20)
TO GROUND WATER
3.32
SEEPAGE
PRODUCT & NON-CLAY WASTE
0.46 STORAGE
8.79
1.24
DISCHARGE No.
001
EXCESS RAINFALL
1.75
SETTLING AREA
16.85 STORAGE
135.81
(130.72)
CLEAR WATER POND
TO SURFACE WATER
2.31

NOTE: 1. Flow is in million gallons per day.
2. Values in parenthesis apply after introduction of Brushy Creek Reservoir.

Figure 2.5-1. Schematic of Water Flow for the Proposed MCC Mine.

2.6 LIQUID EFFLUENT DISPOSAL

It is MCC's objective to discharge a minimum amount of water while maintaining the quality of the water discharged. Water would be discharged primarily when the volume of water exceeds that which the mining, waste disposal, and recirculation system catchment areas could handle. Releases of clear water would be made in order to preserve the free board requirements for waste disposal areas. The majority of the excess water would consist of rain water falling directly into the process water pools and runoff water from the mined and partially reclaimed areas. The water recirculation system is designed to contain rain water influx up to the 24-hour, 25-year storm event.

The four months with highest probability for effluent discharge are June, July, August, and September. It is estimated that an average of 2.31 mgd might be discharged on a daily basis during this four-month period (Figure 2.5-1). Maximum discharge rate is estimated to be 20 mgd. The quality of the effluent discharge is described in Section 3.2.1. Discharges to surface water and ground water were the alternatives considered for the MCC project. The effluent quality and quantity would be unaffected by the choice of discharge alternatives.

2.6.1 Method Description and Technical Considerations

2.6.1.1 Surface Water Discharge (Proposed by MCC)

There are two alternative discharge methods which have been considered for MCC emergency effluent discharge to surface waters; these are listed below and illustrated on Figure 2.6-1:

Alternative 1: Discharge 001 - Oak Creek discharge near the Vandolah Plant site location. Discharge 001 is not expected to be relocated during the life of the mine (Proposed by MCC).

Alternative 2: Discharge 002 - Initially, release from MC-1 recirculation system into the northern portion of Hickory Creek;

Discharge 003 - Later in mine life, release into Hickory Creek near the southern property boundary. As mining progresses in the Hickory Creek basin, it would be necessary to terminate Discharge 002 in year 8 and initiate Discharge 003.

2.6.1.2 Ground Water Discharge

The relatively small (and periodic) volume of discharge anticipated, the quality of water to be discharged (lack of hazardous constituents), and the high cost of a deep well injection system preclude this as a viable alternative. As effects expected to be incurred from surface discharge are not significantly adverse, no detailed analysis was performed for the ground water disposal alternative.

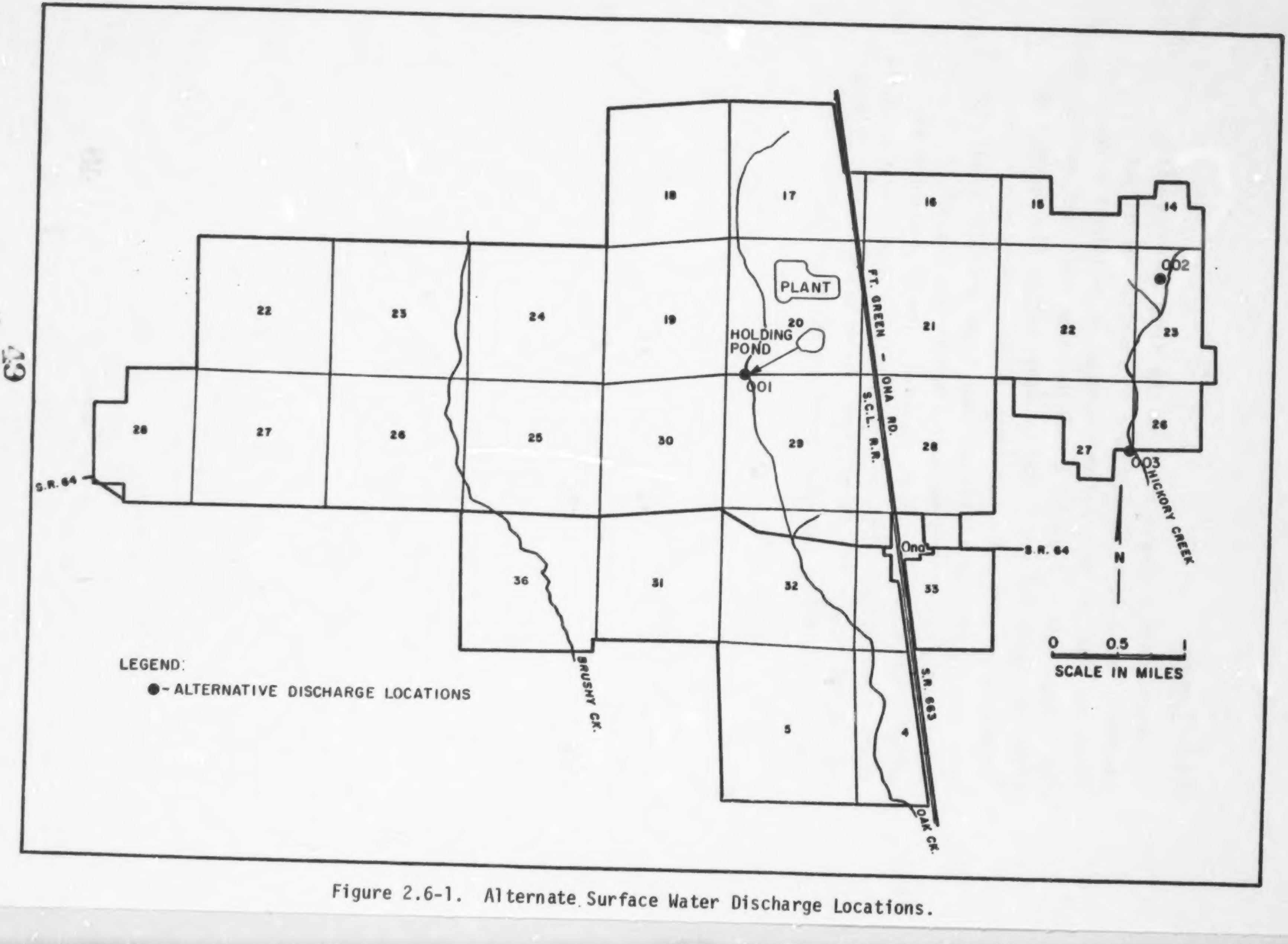
2.6.2 Environmental Considerations

Since ground water discharge is not considered to be a viable alternative, the environmental impacts of this alternative will not be discussed in this section. Under a surface water discharge plan, Discharge 001 would significantly affect the Oak Creek drainage course; Discharges 002 and 003 would impact Hickory Creek. Both the 001 and 002 discharge points would allow better filtration and ecosystem improvement of the water quality before the water leaves the property than would Discharge 003.

The proposed plan provides for discharges to be routed to Oak Creek (Discharge 001). Oak Creek was selected because it is near the proposed plant site and because the other discharge points would offer no particular environmental advantages over the Discharge 001 location. It is expected that water released to Oak Creek through this discharge would have higher oxygen content than that now existing in the stream. Average dissolved oxygen (DO) levels of 2.9 mg/l have been reported for Oak Creek (Table 3.2-3); the limited DO data available for mine effluents show DO concentrations of 10.0 and 7.5 mg/l in water flowing through phosphate-mined areas.

2.6.3 Summary

Ground water discharge offers no significant environmental advantages and would be substantially more costly than surface discharge; therefore only surface discharge was considered in detail. The proposed plan of discharging from the clear water pond into Oak Creek (Discharge 001) would increase annual average flow by about 32 percent but would not have significant adverse effects on existing water quality (Section 3.2.1). Although total suspended solids (TSS) and oil and grease content may exceed ambient stream standards, dissolved oxygen content should be increased. The alternative of discharging into Hickory Creek would not provide as good filtration during most of the project life (particularly during years 8 through 32 from Discharge 003) before the water leaves the MCC property.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PLANT
HOLDING POND
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4
FT. GREEN – ONA RD.
S.C.L. R.R.
S.R. 663
S.R. 64
S.R. 64
Ona
HICKORY CREEK
BRUSHY CK.
OAK CK.
N
0
0.5
1
SCALE IN MILES
LEGEND:
● - ALTERNATIVE DISCHARGE LOCATIONS

Figure 2.6-1. Alternate Surface Water Discharge Locations.

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2.7 ROCK DRYING

The Central Florida Phosphate Industry Areawide EIS (USEPA, 1978) recommended that rock dryers be eliminated at phosphate mines in Florida. Case by case consideration of exceptions to this recommendation could be considered on the basis of energy savings as long as air quality could be adequately protected in Florida.

MCC has proposed to install a rock dryer at their Hardee County mine. A decision about drying the phosphate rock at the Hardee County mine site is extremely important to Mississippi Chemical Corporation's operations at their Pascagoula fertilizer plant and their plans to sell excess rock to other customers. Since MCC's Pascagoula plant is designed to process dry rock, omission of a rock dryer at Ona would require facility changes at the Pascagoula plant. There are two basic options at the mine:

1) Provide a rock dryer; and
2) Ship the rock wet (no dryer).

Of the 3 million tons mined per year at Ona, 1 million tons are to be shipped to MCC's Pascagoula plant. The remaining 2 million tons of rock per year will be sold to other customers whose locations and facilities are unknown. There are three options for MCC's Pascagoula operations:

1) Receive and process dry rock. This would follow issuance of a permit to construct a rock dryer at Ona. Operations at Pascagoula would be unchanged from present.
2) Receive wet rock, and dry it at Pascagoula. This would require construction and operation of a dryer at Pascagoula.
3) Receive and process wet rock. This would require process changes at Pascagoula.

Options available to MCC's other customers may be similar to those open to MCC at Pascagoula, though actual plant modifications may be somewhat different.

Selection of alternative rock drying systems for analysis in the DEIS was made with the intent of covering the entire range of possibilities. The following alternatives were selected.

1) Dry all rock at Ona (proposed by MCC).
2) Ship all rock wet from Ona; dry it at the fertilizer plants.
3) Ship all rock wet from Ona; process it wet at the fertilizer plants.

Quantitative analyses were made of a wide range of environmental impacts relating to the Ona operations and MCC's Pascagoula plant. Only qualitative assessments can be provided for impacts expected at other customer facilities. Some of the rock could be shipped without drying to customers who can process wet rock; this situation would be a combination of the selected alternatives, though it is not possible to determine the fraction of rock which might be shipped wet during the project lifetime. In accordance with stipulations in the Development Order (Appendix C), MCC will actively seek wet rock customers. A detailed analysis of the impacts of each alternative is provided in TSD-I.

2.7.1 Rock Dryer at Ona (Proposed by MCC)

2.7.1.1 Description of System

MCC proposes to install a fluidized bed dryer fired by No. 6 fuel oil at the beneficiation plant in Hardee County so that dry phosphate rock can be shipped to Pascagoula and to customers that need dry rock. The major rock handling activities for this alternative are shown on Figure 2.7-1. The rock is mined, transported by pipeline in a slurry to the beneficiation plant, conveyed to various storage areas for drying and transfer to rail cars, transferred again to barges at Tampa, and then shipped to Pascagoula or to other customers for grinding and chemical processing.

The rock handling facilities at the beneficiation plant would be suitable for shipping wet rock to customers who can accept it.

However, for simplicity of presentation and to express worst-case conditions at Ona, the proposed action is analyzed on the basis of drying all of the rock produced from the mine.

2.7.1.2 Environmental Considerations

Drying the phosphate rock at the mine site would substantially increase emissions of SO_2 and particulates (PM) at Ona; state and federal ambient air quality standards and prevention of significant deterioration (PSD) regulations could be met, however (TSD-III and Section 3.4). Associated with these emissions would be very slight increased levels of airborne radionuclides (TSD-V and Section 3.6). Energy use would also substantially increase (by approximately 220,000 barrels of oil per year) at Ona (TSD-I). Along the rail lines to Tampa and at the ports, there would be a greater release of fugitive dust, though effects should be localized. At Pascagoula, there would be no change in present operations; fugitive dust would be the only noticeable environmental problem. Presumably, this would also be the case at other points of rock delivery.

2.7.1.3 Technical and Economic Considerations

The proposal to dry phosphate rock at the mine for shipment to chemical processing facilities uses technology which is proven and accepted in the industry. MCC's Pascagoula fertilizer plant as well as most other plants along the central Gulf coast where rock from MCC's mine is likely to be shipped, currently process dry phosphate rock. Therefore, by following the proposed action, few new facilities would have to be constructed; process reliability would be a known factor; and maximum flexibility would be available to MCC to meet both present and future market demand.

For the proposed system, the only significant capital investment would be $12 million ($4/ton annual capacity) for the rock dryer at the mine. The most significant operating cost would be $6.31/ton for port handling and barge transport. Investments required at other points of delivery cannot be determined.

2.7.2 Rock Dryer at Chemical Plant

2.7.2.1 Description of System

This alternative assumes that rock drying is eliminated at the Hardee County mine site. Wet rock would be loaded onto rail cars, transferred to barges, and shipped to Pascagoula (and to other customers) where it would be dried and processed in a manner similar to that planned in the proposed action. The major phosphate rock handling activities for this alternative are shown on Figure 2.7-2.

2.7.2.2 Environmental Considerations

Drying the phosphate rock at the chemical plants would produce virtually the same amount of SO_2 and PM emissions as the proposed action, but the sources would be scattered and smaller in size. At Pascagoula, another PSD permit would be required; ambient air quality restrictions there are substantially greater than at Ona. Energy use would be greater for this alternative than for the proposed action because the moisture in the rock would have to be transported by rail and barge. The potential for fugitive emissions from rail and ship handling would be decreased.

2.7.2.3 Technical and Economic Considerations

This alternative substitutes rock drying at the chemical plant for drying at the Hardee County mine site. Facilities would be required to store and handle wet rock at the beneficiation plant and at the point of rock delivery. A rock dryer and new wet rock handling and storage facilities would have to be built at Pascagoula. There are no technical difficulties associated with this alternative; process reliability is a known factor, and sufficient storage would be available to minimize the chance of plant shutdown resulting from dryer outage.

With this alternative, MCC would not have the flexibility of selling to customers who must use dry rock and do not have their own drying facilities. Currently, although approximately 43 percent of the phosphate rock produced in the southeastern United States enters the phosphoric acid process as wet rock, 93 percent of this rock is captive (i.e., mined by the same company which processes it). Also, only 8 percent of the wet rock grinding capacity is outside the producing area, and all of this is captive. Wet rock is not currently shipped in international trade. These data indicate that most noncaptive phosphate rock demand is for dry rock, rather than wet. It is likely that MCC would have difficulty finding customers for 2 million tons of wet rock per year.

Significant capital investments would be required for wet rock unloading, storage, and dryer facilities at Pascagoula ($13.4 million, or $13.4/ton). Operating costs would be higher than for the proposed alternative, primarily because of the need to transport moisture in the rock. The most significant operating cost would be $7.12/ton for port handling and barge transport. No information can be provided on costs for customer facilities, though it may be reasonable to assume these will be similar to MCC's.

Because wet rock offloading of barges is a slower process than for dry rock, dock facility expansion would be required to implement this alternative at MCC's Pascagoula plant. A Section 10 construction permit would be required from the Corps of Engineers.

2.7.3 No Rock Dryer

2.7.3.1 System Description

This alternative assumes that rock drying is eliminated both at the Hardee County mine site and at Pascagoula. Wet rock would be processed into phosphoric acid at the Pascagoula plant (and at other customer plants). Since there is currently no wet rock process available for producing triple superphosphate, MCC would have to purchase sufficient dry rock from other sources for this purpose. A schematic of the major phosphate rock handling activities for this alternative is shown on Figure 2.7-3.

2.7.3.2 Environmental Considerations

Air quality effects of this alternative are less certain than for the others. Though emissions at Ona would be reduced substantially from the proposed action, and also to an extent along the transportation routes, emissions at the chemical plants would be dependent on existing facilities. For MCC's Pascagoula plant, a water balance and liquid effluent limitation would require that a large new steam generator be built; consequent emissions and air quality impacts would be substantial, requiring a PSD permit and, perhaps, emission offsets. At other plants specifically designed to process wet rock, emissions might be very low. Energy use would also be plant-specific. At Pascagoula, the new boiler would require substantial fuel oil, more per ton of rock than a dryer.

2.7.3.3 Technical and Economic Considerations

In addition to building facilities for wet rock handling at the beneficiation and chemical plants, significant changes would be required in the Pascagoula phosphoric acid plant and downstream processing facilities; it is not known whether similar changes would be required for other customers. The additional water introduced into the process stream with the wet rock and for wet rock grinding could normally be handled without technical difficulties. However, at Pascagoula, a water balance problem would be created with consequent effects on energy use, cost, and/or water quality.

This alternative would require that MCC market phosphate rock to customers who do not need dry rock. As described in Section 2.7.2, most wet rock processing is done at captive plants located in Florida. For at least the immediate future, this alternative would have a significant, adverse effect on MCC's market potential and flexibility to sell phosphate rock.

As an additional technical consideration, a change to wet rock grinding eliminates any possibility for MCC to adopt the newly-developed hemihydrate phosphoric acid production processes at the

Pascagoula plant. This new process technology has the advantage of increasing overall P_2O_5 recovery from 93 percent to 98 percent and significantly reduces energy use per ton of P_2O_5 produced.

Though there are no unusual reliability or safety problems associated with processing wet rock, the reduced ground rock storage capacities which can be provided at Pascagoula increase the chance for plant shutdown should the wet rock grinder malfunction. Also, a Section 10 permit would be required for dock construction and dredging in Bayou Casotte (as with the alternative for rock drying at the chemical plant).

Capital investments required to implement this alternative are substantial. These include \$10.7 million for phosphoric acid facility modifications, \$9 million for wet rock unloading and storage facilities, and \$5.1 million for wet rock grinding; all of these facilities would be located in Pascagoula. Operating costs would also be substantial, totaling \$17.98/ton of rock; the most significant of these are \$6.04/ton for phosphoric acid processing and \$7.12/ton for port handling and barge transport. Again, cost estimates cannot be made for other customers.

2.7.4 Summary

A summary of the environmental, economic, and other issues of concern in selecting among the three basic rock drying alternatives is provided in Table 2.7-1. Under the conditions and assumptions expected to prevail for at least the early years of the mine life (see TSD-I), the proposal to dry rock at the Hardee County mine is expected to be preferred with regard to nearly all of these issues. These include energy use: a savings of 13,000 to 109,000 barrels of fuel oil (equivalent) annually; capital investment: a savings of \$10.5 million to \$21.9 million; and operating cost: a savings of \$1.9 million to \$5.1 million annually. With regard to air quality, the proposed action would have more adverse effects in Florida, but less in Pascagoula and other places where the rock would be dried. If wet rock were to be transported, the requirement for dredging and dock expansion at Pascagoula would adversely affect water quality and impose some uncertainty regarding the necessary Section 10 permit. Finally, and very significantly for the economic viability of the project, MCC would have great difficulty finding buyers for 2 million tons of wet rock per year.

TABLE 2.7-1

COMPARISON OF MCC ROCK DRYING ALTERNATIVES[a]

Page 1 of 2

Impact Issues[b]	Proposed Action - Rock Dryer at Mine	Alternative No. 1 - Dry Rock on Delivery	Alternative No. 2 - Process Wet Rock[d]
Energy Use (bbl/yr)	176,000	189,000	285,000
Capital Investment[c] (10^6 dollars)	4.00	14.53	25.93
Annual Operating Cost[c] (10^6 dollars/yr)	12.85	14.76	17.98
Air Quality	Significant SO_2 and PM emissions at Ona; meets all standards.	Significant SO_2 emissions at Pascagoula; may require special mitigation for PSD permit approval.	Significant SO_2 emissions at Pascagoula; likely exceeds PSD or NAAQS standards without special mitigation.
Land Use (acres)	10	12	12
Water Quality	No adverse effect.	Temporary effects from dredging in Bayou Casotte.	Temporary effects from dredging in Bayou Casotte.
Other Considerations	No adverse effects.	Some uncertainty introduced by need for dredge and fill permit.	Some uncertainty introduced by need for dredge and fill permit.
Feasibility/Reliability	No concerns.	No concerns.	Slight increase in potential for plant shutdown due to wet rock grinder malfunction.

TABLE 2.7-1 (Continued)

Page 2 of 2

Impact Issues[b]	Proposed Action - Rock Dryer at Mine	Alternative No. 1 - Dry Rock on Delivery	Alternative No. 2 - Process Wet Rock[d]
Market Potential	Maximum flexibility to satisfy customer demands.	Very limited market for wet rock at present. No flexibility to meet changing customer demands.	Very limited market for wet rock at present. No flexibility to meet changing customer demands.

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[a] Comparisons are made for processing of rock at the Pascagoula plant.

[b] All impacts are expressed per ton of "bone dry" rock.

[c] Costs are given only for facilities needed to provide 1,000,000 tons "bone dry" rock/year to MCC's Pascagoula plant; no costs are reported for rock shipped to other customers.

[d] Assumes existing NPDES permit is not revised to allow greater effluent discharge to Bayou Casotte. For the effects of allowing increased liquid waste discharge, see Section 5.3.

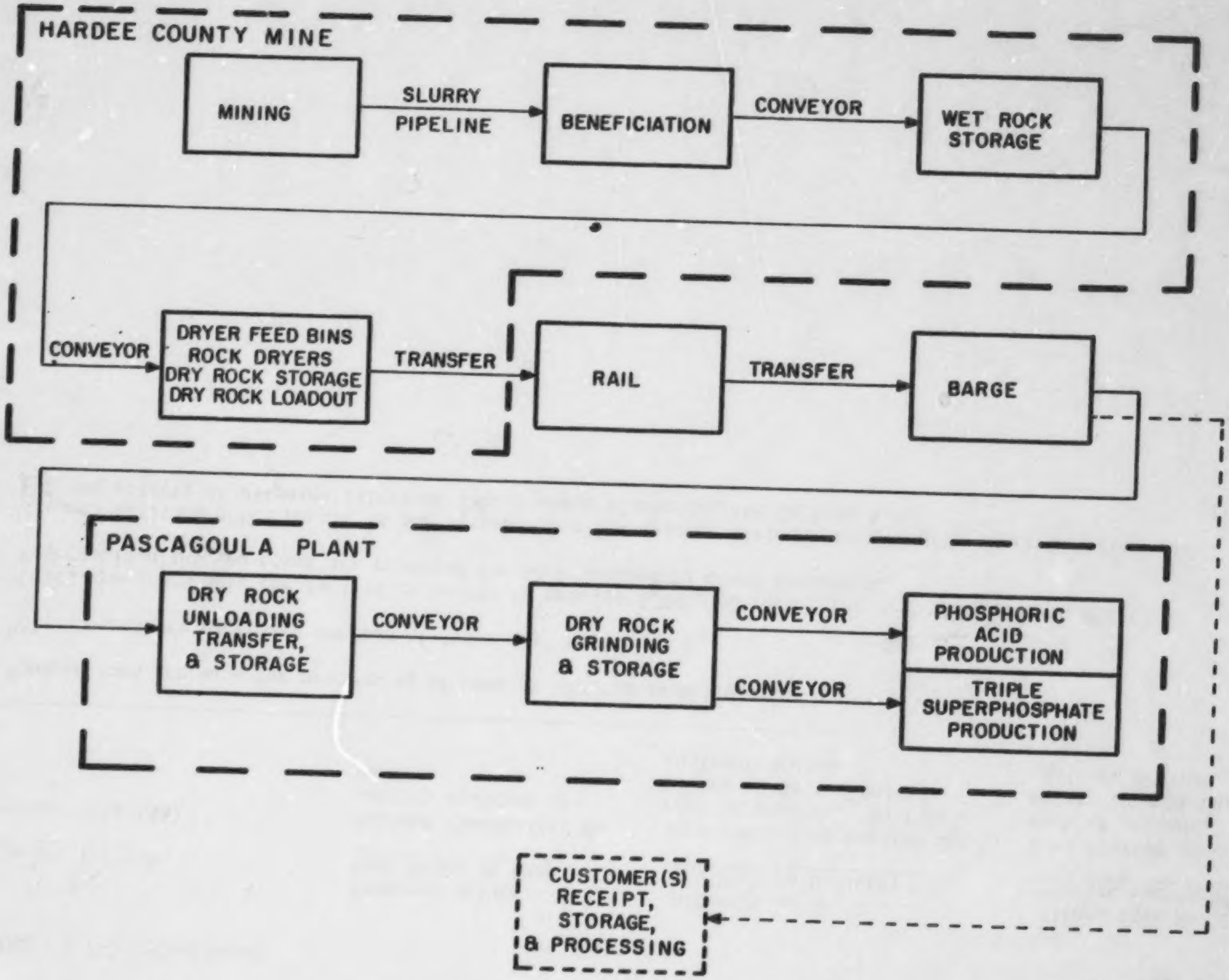
HARDEE COUNTY MINE
MINING
SLURRY PIPELINE
BENEFICIATION
CONVEYOR
WET ROCK STORAGE
CONVEYOR
DRYER FEED BINS
ROCK DRYERS
DRY ROCK STORAGE
DRY ROCK LOADOUT
TRANSFER
RAIL
TRANSFER
BARGE
PASCAGOULA PLANT
DRY ROCK UNLOADING TRANSFER, & STORAGE
CONVEYOR
DRY ROCK GRINDING & STORAGE
CONVEYOR
CONVEYOR
PHOSPHORIC ACID PRODUCTION
TRIPLE SUPERPHOSPHATE PRODUCTION
CUSTOMER(S) RECEIPT, STORAGE, & PROCESSING

Figure 2.7-1. Proposed Action - Rock Dryer at Mine.

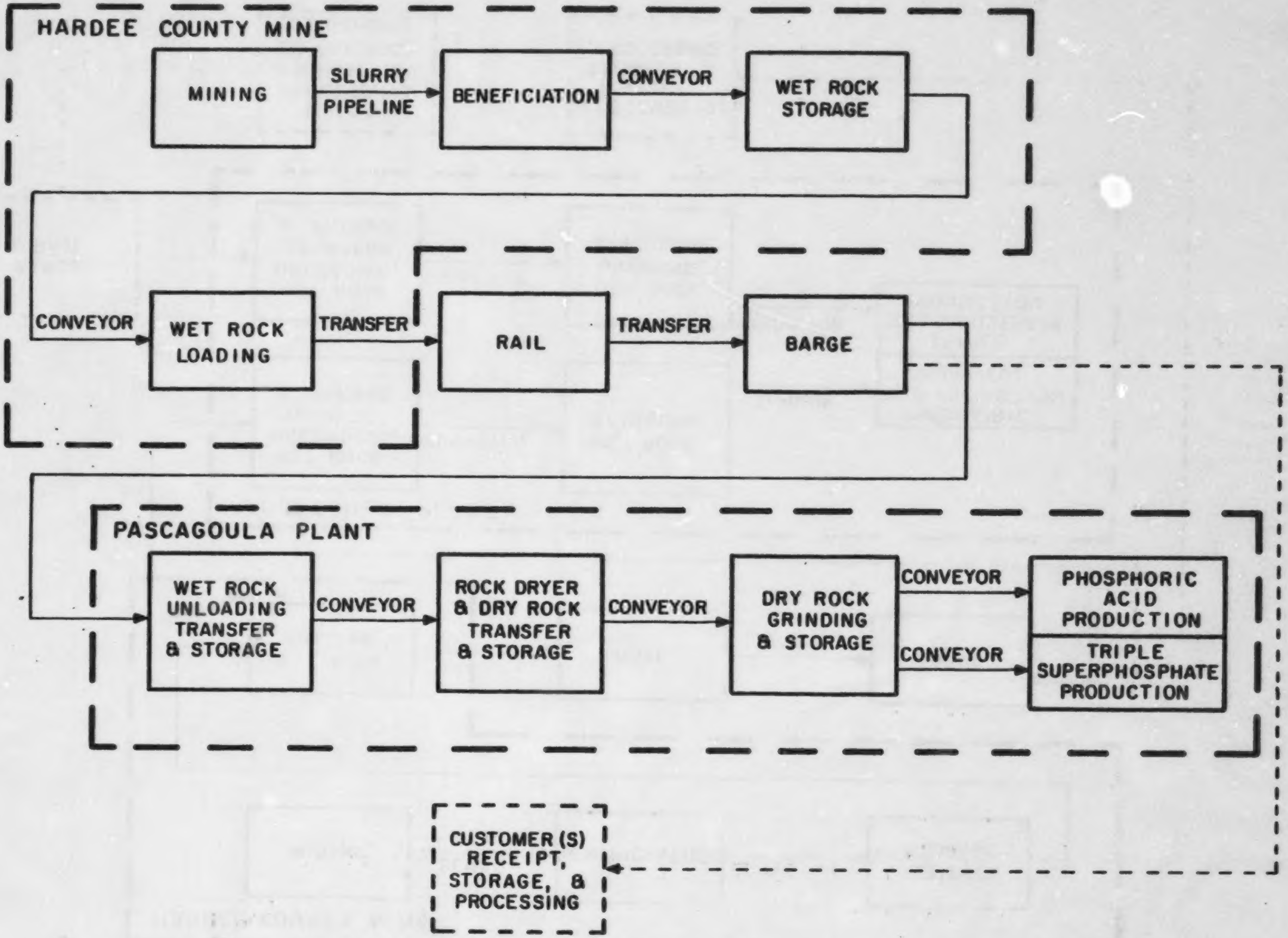
HARDEE COUNTY MINE
MINING
SLURRY PIPELINE
BENEFICIATION
CONVEYOR
WET ROCK STORAGE
CONVEYOR
WET ROCK LOADING
TRANSFER
RAIL
TRANSFER
BARGE
PASCAGOULA PLANT
WET ROCK UNLOADING TRANSFER & STORAGE
CONVEYOR
ROCK DRYER & DRY ROCK TRANSFER & STORAGE
CONVEYOR
DRY ROCK GRINDING & STORAGE
CONVEYOR
PHOSPHORIC ACID PRODUCTION
CONVEYOR
TRIPLE SUPERPHOSPHATE PRODUCTION
CUSTOMER (S) RECEIPT, STORAGE, & PROCESSING

Figure 2.7-2: Alternate No. 1 - Rock Dryer at Chemical Plant.

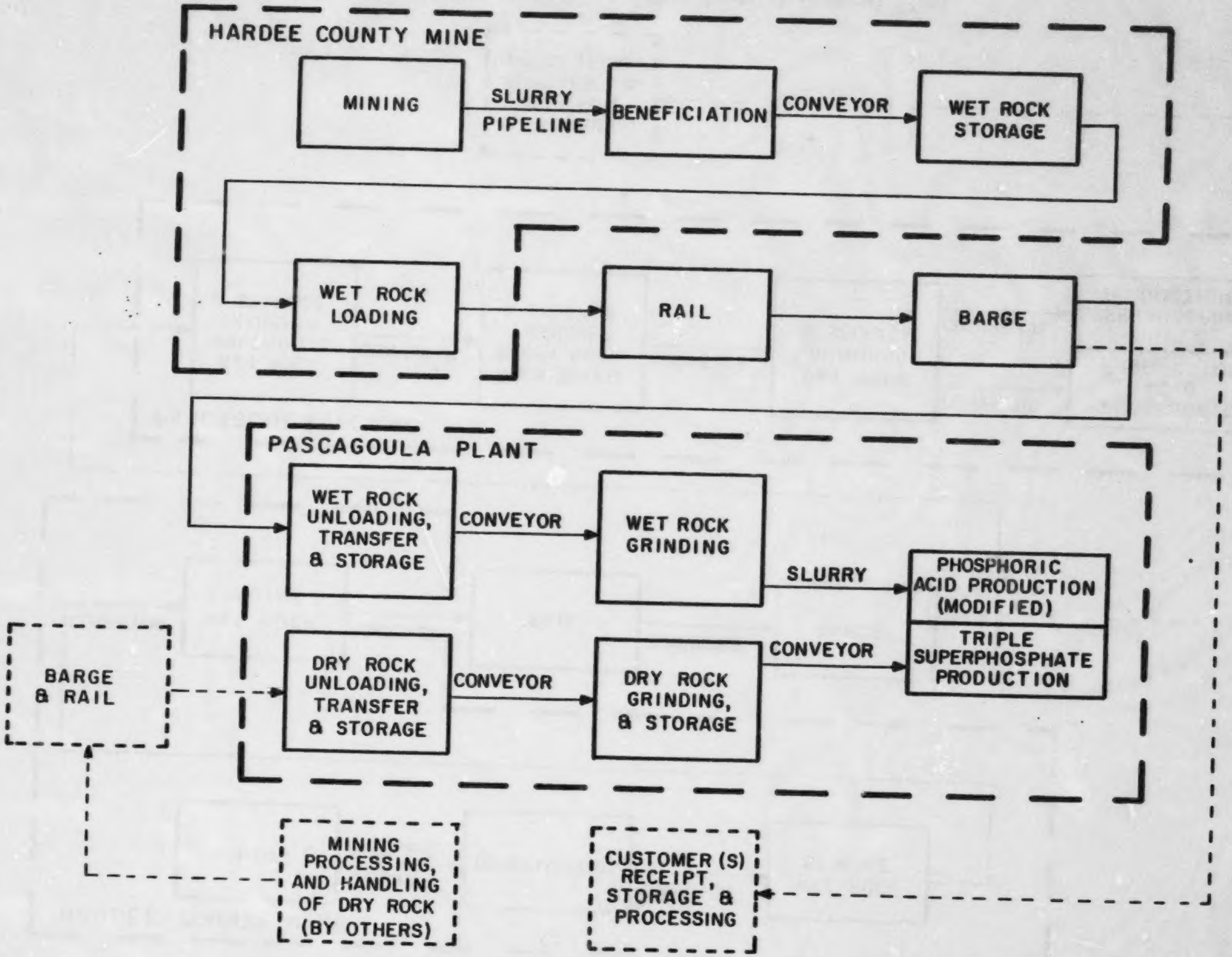
HARDEE COUNTY MINE
MINING
SLURRY PIPELINE
BENEFICIATION
CONVEYOR
WET ROCK STORAGE
WET ROCK LOADING
RAIL
BARGE
PASCAGOULA PLANT
WET ROCK UNLOADING, TRANSFER & STORAGE
CONVEYOR
WET ROCK GRINDING
SLURRY
PHOSPHORIC ACID PRODUCTION (MODIFIED)
TRIPLE SUPERPHOSPHATE PRODUCTION
CONVEYOR
DRY ROCK GRINDING, & STORAGE
CONVEYOR
DRY ROCK UNLOADING, TRANSFER & STORAGE
BARGE & RAIL
MINING PROCESSING, AND HANDLING OF DRY ROCK (BY OTHERS)
CUSTOMER (S) RECEIPT, STORAGE & PROCESSING

Figure 2.7-3. Alternate No. 2 - No Rock Dryer.

2.8 WASTE DISPOSAL

Waste disposal methods are a major consideration in the planning of a phosphate mining operation. Disposal of the large quantities of waste clays and sand tailings that are produced in a phosphate complex requires extensive planning to minimize adverse impacts on the environment, mining, and on operations and to maximize opportunities for land reclamation to optimum alternative uses. Other environmental factors such as aesthetics and the various regulatory requirements must also be considered in preparing a waste disposal plan.

The conventional waste disposal method was selected as the proposed method in the ADA/DRI for this project (MCC, 1977). However, concerns were raised by various state and federal agencies with regard to the extensive above-ground clay disposal areas resulting from the conventional approach. In addition, the central Florida Phosphate Industry Areawide EIS (USEPA, 1978) recommends the minimization of above-ground storage areas. This led to a re-evaluation of the originally-proposed waste disposal method for the MCC project. Sand/clay mixing, an environmentally preferable waste disposal method (USEPA, 1978), was the second alternative considered. However, detailed engineering analyses indicated that the matrix ore on the MCC tract does not contain sufficient sand to permit the successful use of this method alone. Therefore, conventional waste disposal with sand/clay capping was adopted as the third (and proposed by MCC) alternative. Each of these methods is discussed in the following sections.

2.8.1 Conventional Method

Traditionally, the central Florida phosphate industry has utilized conventional waste disposal practices, separating sand and clay wastes at the beneficiation plant prior to disposal.

2.8.1.1 Method Description

Under the conventional waste diposal method, sand and clay wastes are routed to separate areas for disposal. The disposal of sand tailings has not generally been a problem in the phosphate industry. Usually, tails have been deposited in mine cuts as back-fill or have been utilized in the construction of holding dikes. However, disposal of waste clays has been a more complex concern because of the large amount of process water contained in the clays. The clay slurry is discharged from the beneficiation plant at 4 to 6 percent solids and is deposited in holding areas. Slowly, over a number of years, the clays consolidate to 20 percent solids. The increase in waste volume resulting from the 80 percent retained moisture requires that the clays be stored in above-ground impoundments.

Under the conventional disposal plan, clay storage areas would cover about 7,500 acres of the MCC site and would be surrounded by 60-foot-high dikes. A total of 11 impoundments would be built on the site. Individual clay disposal areas would range from 351 to 1,167 acres in size and from 23,342 to 89,171 acre-feet in capacity. The total clay storage capacity would be sufficient to accommodate the 529,000 acre-feet of clay produced over the project life, assuming stage-settling in certain storage areas (MCC, 1977). Stage settling would allow time for the clay wastes contained in some areas to settle before addition of new clays, providing additional capacity as a result of the compaction of the original waste clay.

Sand tailings would be used for sand fill, land-and-lakes reclamation, and dike construction around clay settling areas. Approximately 146,000 acre-feet (assuming a nominal density of 100 pounds per cubic foot) of sand tailings would be accommodated by the conventional plan. About half of this volume would be used for dam construction, thus minimizing the need to discharge tailings above-ground in unmineable areas.

Sand would normally be distributed to mined-out areas or to portions of a mining block which would not be totally filled with tails but would eventually be reclaimed as land-and-lakes or used for dike construction activities. However, when no tails disposal areas are available, tails would be diverted to locations within certain clay settling areas.

2.8.1.2 Environmental Considerations

Conventional waste disposal methods have a number of environmental advantages and disadvantages. Among the advantages of this method of waste disposal are the following: (1) a relatively low amount of energy is needed to operate the system; (2) the method provides for catchment and storage of rain water, reducing the need for ground water supplies; (3) the clays are not contaminated with sand so that future phosphate recovery is possible; and 4) reclamation of land not included in settling areas can be accomplished in a predictable manner, based on past reclamation experience obtained by the phosphate industry.

Among the disadvantages inherent in this method of waste disposal are: (1) the height required for the dikes to contain the clays, (2) the large amount of area needed to store the clays, 3) the limited potential usage of the land after reclamation; 4) the potential for surface water contamination and loss of biological resources if dike failure occurs; 5) the long period of time required for waste clays to compact and release water; 6) the poor strength and drainage characteristics of soils in settling areas; and 7) for the MCC site, the relatively small volume of overburden would not allow complete coverage of the waste clays, thereby resulting in elevated levels of radioactivity in surface soils.

2.8.1.3 Technical Considerations

The conventional waste disposal method is an operationally proven method of clay and tails disposal. This system provides areas for storage of make-up water and accumulation of rainfall. The large impoundment areas allow maximum accumulation of rain and a minimum discharge of water; this reduces the consumption of ground water. Another positive consideration for this method of waste is that the P_2O_5 still contained in the clays remains available for extraction should recovery be feasible at a future time.

Low soil strength has been associated with waste clay settling areas. Compaction and consolidation of the clays continues for an extended period of time. In order to improve the soil strength, waste clay areas can be capped with sand tailings or overburden to provide additional soil stability at the surface.

In order to increase consolidation of the clays and reduce the total volume of above-grade clay disposal areas, stage settling can be incorporated into this method. Settling of this type requires the rotation of clay deposition among several ponds to achieve a higher percentage of clay solids. Water is periodically drawn from the surface of the disposal areas, promoting the compaction process. This cycle of filling and drying can achieve an overall higher average percent solids.

2.8.2 Sand/Clay Mixing Method

The Central Florida Phosphate Areawide Impact Assessment Program (USEPA, 1978) recommends sand/clay mixing for waste disposal whenever possible. However, this method has not been employed at any full-scale mining operations to date. Results of tests on pilot projects have been inconsistent and often contradictory in nature.

2.8.2.1 Method Description

Under this disposal method, sand and clay are mixed at a minimum ratio of 2 to 1 before routing to common disposal areas. This ratio is the minimum that is considered technically feasible for good mixing of sand and clay.

Several methods have been developed to combine the sand and clay wastes. These include: the sand spray process, the use of chemical flocculants, and the dredge-mix method. The sand spray process involves placement of clays into mined-out areas where the clays are allowed to settle from 3 percent to 12 to 15 percent solids. A floating/suspended pipeline equipped with spray nozzles is then used to deposit a layer of sand tailings over the clay. After a period of time is allowed for further clay consolidation, another layer of clay is placed over the settled mix. The entire process is repeated until a satisfactory fill level is achieved.

In the flocculation method, chemical flocculants are added to the waste clays. These chemicals increase the consolidation rate of the clays drastically. Waste clays can attain a 12 to 14 percent solids mixture in a short period of time, enabling a release of some water immediately and recirculation into the plant water system.

Clays at the plant are run through a thickener, where flocculants are added. After being removed from the thickener, they are pumped to a disposal site where sand tailings are added to the clays in a 2 to 1 ratio. Sand tailings are also pumped to the site, then dewatered before mixing. The mixture is pumped into the above-grade area to allow for consolidation. Several fillings are required to ensure an adequate height.

The dredge-mix method involves construction of settling ponds for clay consolidation by gravity. Clays enter the ponds at 4 to 6 percent solids and, in 6 months time, reach a 12 to 14 percent solids content. A minimum of two containment areas are necessary for the plan to work. One area receives clays while the second is used for settling. A dredge is used to pump the thickened clays from one area to the other.

2.8.2.2 Environmental Considerations

Sand/clay mixing would entail both environmental advantages and disadvantages if used on the MCC site. Advantages of this waste disposal method include the following: (1) improvement of soil fertility and strength; (2) increased land use potential, (3) lowered dam heights and reduced amount of above-grade settling areas (compared to conventional method); (5) greater flexibility in placement of wastes; and (6) reduced levels of radioactivity in surface soils compared to the conventional method.

Disadvantages which might be associated with the sand/clay mix disposal method are the following: (1) at least two thickening ponds are needed; (2) it has reduced storage and catchment of rainfall and make-up water; (3) separation of the sand and clay mixture can occur, and (4) flocculants, if used, can be introduced into the local aquatic environment and aquifers.

2.8.2.3 Technical Considerations

Several technical considerations make the sand/clay disposal method an unattractive or infeasible alternative for use on the MCC site.

The uncertainty of the sand/clay mix disposal methods' workability on a project-scale level is one of the major factors which must be considered. Although some research has been done with this waste disposal method, most of it has been accomplished in small-scale pilot programs. Much of the data from these programs is proprietary and not available to the general public; some of the data which are available show inconsistent and contradictory results. Recently, one Florida phosphate company requested permission from the state to change its sand/clay reclamation plan to one with separate waste sand and clay storage areas. The change was requested because the sand/clay mix technique did not work as well in the full-scale operation as it had under test conditions.

Another consideration in determining the applicability of this method to waste disposal methods on the MCC site is the nature of the ore body that will be mined there. A sand to clay ratio of 2 to 1 is considered to be the minimum which allows good sand/clay mixing. The ore body on the MCC property has a relatively high clay content (1.92 sand to 1.0 clay).

If the positive test results obtained from pilot scale testing of the sand/clay mix waste disposal technique could be matched in full-scale operations on the MCC site, a number of benefits would be realized by using this method. For example, consolidation of the clays would be increased from about 25 percent under conventional settling methods to 35 percent over a period of 20 years. This decrease in effective consolidation time makes additional waste disposal volume available, lowering the acreage required for storage areas and/or the required dike heights. Faster waste consolidation would also allow more rapid release of water entrained in the waste clays; this water would be made available to the beneficiation process, thus lowering the requirement for ground water.

2.8.3 Conventional Disposal Plus Sand/Clay Capping (Proposed by MCC)

This waste disposal method incorporates aspects of both the conventional and the sand/clay mix methods. Engineering studies have determined that, for the MCC site, this method would provide a greater degree of consolidation than any of the other methods considered. Clay and sand wastes would be deposited in separate holding areas. After an appropriate settling period, some of the clay holding ponds would be capped with a sand/clay mix. The other clay ponds would be partially covered with a tailings/overburden cap. Sand fill areas would be covered with an overburden cap (Table 2.8-1). As proposed, this plan is a substantial improvement over the conventional waste disposal method. In addition, the Development Order (Appendix C) stipulates that MCC would adopt advances in waste clay disposal technology which are feasible on a plant scale and which would reduce above-grade storage requirements. If new disposal technology which would further reduce above-ground waste disposal areas became available, its use on the MCC project would be considered.

2.8.3.1 Method Description

According to the currently proposed waste disposal plan, each of the areas delineated on Figure 2.8-1 would be used for waste storage at some time during the life of the project.

Areas identified on Figure 2.8-1 by the designations "MC," "DA," and "A" would receive only clay wastes. The former two groups of disposal areas would be enclosed by 60-foot and 35-foot dikes, respectively. Dike design for these disposal areas would be in accordance with the Florida Administrative Codes, Chapter 17-9; the proposed construction is shown on Figure 2.8-2. Areas MC-2 and MC-4 would be brought to an at-grade level by transporting clay to other clay storage areas south of SR 64 during the 10-year post-mining reclamation period. Waste clays would generally be held below-grade in areas designated as "A" so that dikes would not generally be required in these areas. In those "A" areas where fill would occasionally surpass the storage capacity, it would be necessary to construct low dikes to contain the wastes.

After construction, "MC" and "DA" areas would be stage-filled, allowing a maximum volume of waste to be stored in each disposal area. "MC" areas would receive two fills. The second fill would be 19.1 percent of the volume of the first and would follow the first by a period of five years to allow dewatering. The "DA" areas would receive three fills, the second one occurring after a minimum delay of three years, and the third following at least five years after the second. Sand/clay caps would be placed over all "MC" areas as well as Area DA-1 five years after the final fill date for each. Caps would be approximately 4 feet thick and would comprise a sand/clay ratio of approximately 8:1. Consolidated clay for capping would be derived from some of the "MC" areas in much the same manner described for the dredge-mix method under the sand/clay mixing disposal alternative in Section 2.8.2.1. Area MC-1 would be the first to be capped; capping would occur in year 14. Clay for capping would be dredged from Area MC-2.

Sand tailings would be used for capping, backfill, and also for dike construction. Tailings disposal areas would be covered with a partial overburden cap. Figure 2.8-1 shows all areas to receive tails along with the years they would be placed.

2.8.3.2 Environmental Considerations

Because this method is a combination of the conventional and the sand/clay mix disposal methods, many of the environmental considerations are the same as those discussed in Sections 2.8.1.2 and 2.8.2.2. Additional advantages of the proposed method include the following: 1) capped clay settling areas would have a potential for more varied land use (such as improved fertility for agricultural use), 2) this method provides for the maximum extent of clay consolidation, given the conditions at the proposed MCC site, and 3) above-grade tails storage would not be required. Although the proposed method is an extension of present practices, it is not radically different and is not expected to pose significant technical problems with full-scale application.

2.8.3.3 Technical Considerations

Since this method is a combination of the conventional and the sand/clay mix disposal methods, the technical and economic considerations are the same as those discussed in Sections 2.8.1.3 and 2.8.2.3.

2.8.4 Summary

Normally, the preferred method of waste disposal is by mixing the sand and clay together prior to disposal so that maximum consolidation, rapid water recovery, and good soil properties can be obtained. However, this method has been determined to be infeasible for MCC's site because of a lack of sufficient sand in the matrix.

For the MCC site, the sand/clay cap method is preferred from both a technical and environmental standpoint. Sand/clay capping reduces above ground clay storage areas from about 7,500 acres to about 3,700 acres, compared to the conventional waste disposal method. Water is recovered from the clays more rapidly. The sand/clay ratio in the caps would be about 8:1, which is not exceptionally good for agricultural use, but is better than pure clay (which would occur in places with conventional disposal). Also, the level of radioactivity in the upper 6 feet of soils would be reduced compared to that which could be expected with conventional disposal practices.

TABLE 2.8-1

MCC PROPOSED WASTE DISPOSAL/RECLAMATION PLAN: APPROXIMATE ACREAGES AFFECTED

Grade/Fill	Cap	Areas	Acres
Above-Grade/Clay	Sand/Clay	MC (except MC-2 and MC-4)	3,623
At-Grade/Clay	Sand/Clay	DA-1	470
At-Grade/Clay	Tails/Overburden, Partial[a]	MC-2, MC-4	871
At-Grade/Clay	Tails/Overburden, Partial[b]	DA (except DA-1), A	4,081
Sand Fill	Overburden	B, BCR	1,677[c]
Total			10,722

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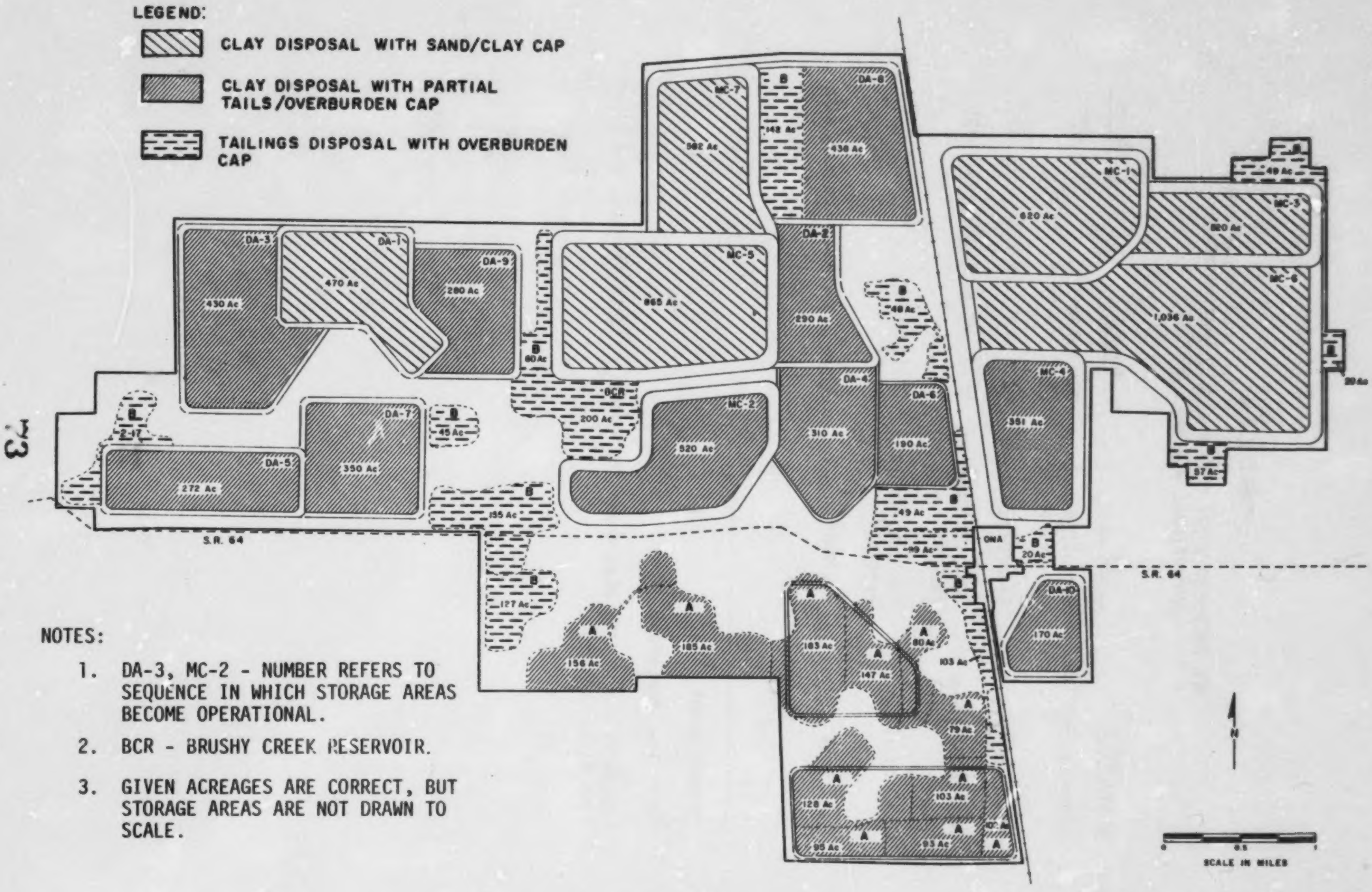
[a] Dredge ponds.

[b] With low, temporary dikes.

[c] Includes plant site plus areas for roads, rights-of-ways, and other land disturbances.

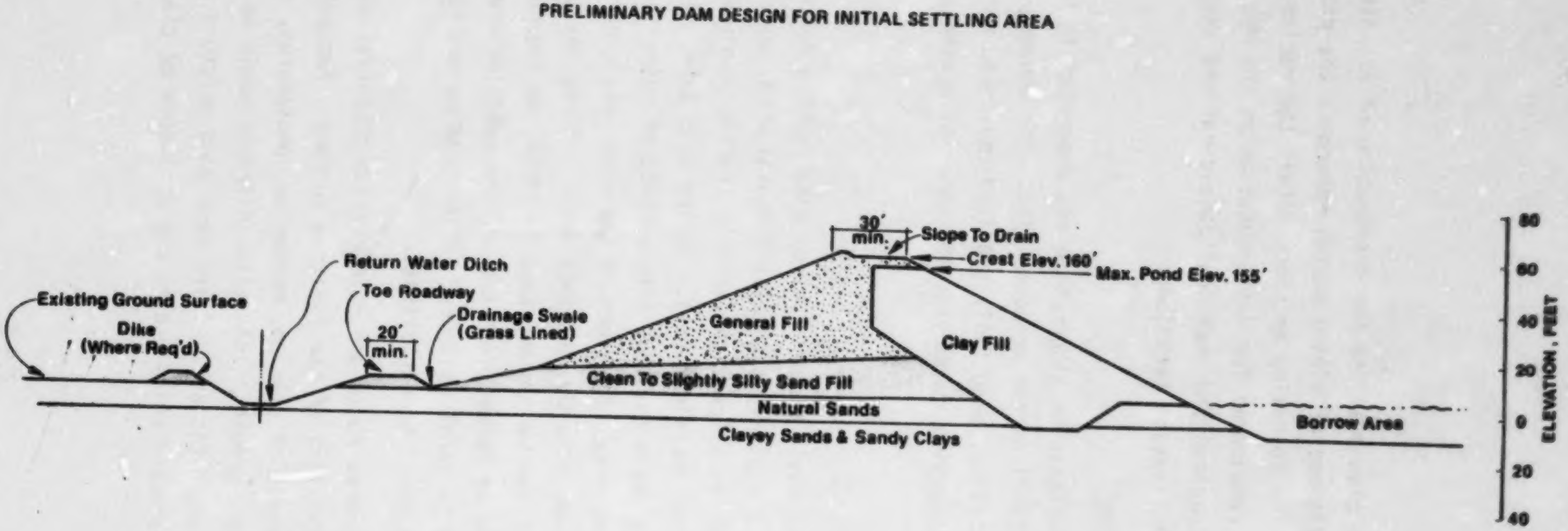


LEGEND:
CLAY DISPOSAL WITH SAND/CLAY CAP
CLAY DISPOSAL WITH PARTIAL TAILS/OVERBURDEN CAP
TAILINGS DISPOSAL WITH OVERBURDEN CAP
MC-7
582 Ac
B
148 Ac
DA-8
438 Ac
MC-1
620 Ac
MC-3
820 Ac
B
49 Ac
MC-6
1,036 Ac
B
20 Ac
DA-3
430 Ac
DA-1
470 Ac
DA-9
280 Ac
MC-5
865 Ac
DA-2
290 Ac
B
48 Ac
B
60 Ac
BCR
200 Ac
MC-2
520 Ac
DA-4
310 Ac
DA-6
190 Ac
MC-4
351 Ac
B
37 Ac
B
2-17
B
45 Ac
DA-7
350 Ac
DA-5
272 Ac
B
155 Ac
B
49 Ac
99 Ac
ONA
B
20 Ac
S.R. 64
S.R. 64
B
DA-10
170 Ac
B
127 Ac
A
156 Ac
A
185 Ac
A
183 Ac
A
147 Ac
A
80 Ac
103 Ac
A
79 Ac
A
128 Ac
A
103 Ac
A
95 Ac
A
93 Ac
102 Ac
A
N
0
0.5
1
SCALE IN MILES

NOTES:

1. DA-3, MC-2 - NUMBER REFERS TO SEQUENCE IN WHICH STORAGE AREAS BECOME OPERATIONAL.
2. BCR - BRUSHY CREEK RESERVOIR.
3. GIVEN ACREAGES ARE CORRECT, BUT STORAGE AREAS ARE NOT DRAWN TO SCALE.

Figure 2.8-1. Conventional Method Plus Sand/Clay Cap Waste Disposal Plan (Proposed by MCC).


PRELIMINARY DAM DESIGN FOR INITIAL SETTLING AREA
Existing Ground Surface
Dike
(Where Req'd)
Return Water Ditch
Toe Roadway
20'
min.
Drainage Swale
(Grass Lined)
General Fill
30'
min.
Slope To Drain
Crest Elev. 160'
Max. Pond Elev. 155'
Clay Fill
Clean To Slightly Silty Sand Fill
Natural Sands
Clayey Sands & Sandy Clays
Borrow Area
ELEVATION, FEET
80
60
40
20
0
20
40

Source: MCC, 1977.

Figure 2.8-2. Proposed Dam Design for Clay Settling Areas.

2.9 RECLAMATION

The MCC reclamation plan provides for restoration of all disturbed land. Methods used to dispose of mining wastes determine the potential reclamation land uses. The following sections detail the reclamation alternatives which were considered for implementation at the MCC site. Also included are environmental and technical considerations associated with each alternative reclamation technique.

2.9.1 Conventional Method

The conventional reclamation alternative was presented in the initial ADA/DRI (MCC, 1977) as the proposed plan. The conventional method includes clay settling, sand fill, and land-and-lakes reclamation. The following discussion summarizes the material presented in the ADA/DRI.

2.9.1.1 Method Description

Waste clay settling would occur in diked areas with a maximum height of 60 feet. In a typical waste clay disposal area, consolidation would be sufficient to allow light vehicle traffic approximately five to seven years after the final fill. During this time, ditches would be constructed to drain any remaining pockets of water from the interior of the settling area. Portions of the dike retaining walls would then be graded down onto the settling area. Since the dikes would be constructed of overburden and sand tailings, an overburden/sand tailings cap would be formed over much of the settling area. All slopes would be graded to final contours. After grading was completed, selected plant species would be established.

The clay settling area reuse and revegetation potential would depend on the characteristics of the finished surface. Phosphatic clays have suitable levels of calcium, magnesium, phosphorus, and potassium for good plant growth. Initially, nitrogen would be the plant nutrient which was deficient. Clays have good moisture and nutrient retention characteristics due to the dominance of clay-sized particles. This results in a soil that is best suited for growing forage crops for improved pasture use.

Improved pasture would be the dominant land use for reclaimed waste clay areas. Reasons for this include the following: 1) many forage crops are available for use, 2) forage crops develop quickly and prevent erosion, 3) organics are developed, 4) a minimal work effort is required for pasture establishment and maintenance, and 5) improved pasture can be converted to other uses. Areas being reclaimed as improved pasture could be seeded with a variety of grass species, including rye, millet, Argentina, and Pensacola bahia grass. Bahia grass has been shown to survive well on sand, clay, and overburden soils and is able to tolerate short-term flooding.

Legumes such as white clover and hairy indigo would also be considered for planting. In combination with their bacterial symbiont, legumes have the ability to fix atmospheric nitrogen for use by higher plants. A bacterial innoculation of legume seeds would ensure the capacity for nitrogen fixation.

Soil tests would be conducted to indicate fertilizer, lime, and/or other soil needs prior to planting. Forage crops would then be protected from grazing until they were firmly established.

Tailings fill areas would be backfilled almost to original grade. Overburden spoils would then be graded over the sand tailings. The resultant land surfaces would be at or near natural grade. Consequently, the reclaimed land would likely have good structural stability, allowing the possibility of future development (building construction), should that become desirable.

Immediately after grading, tailings fill areas would be seeded with rapidly-germinating grasses to stabilize the soil. Improved pasture grasses are best suited for areas of this type. Coastal and Bermuda grass species are suitable to well-drained areas, while Pensacola bahia grass is preferred in areas experiencing short-term flooding.

The third reclamation type involves the formation of land-and lakes areas by partial backfilling of mine cuts with sand tails and overburden soils. The bottom and shoreline contours would be shaped so that shallow zones would be created to promote establishment of aquatic plant and animal species. This would require a significant earth-moving effort.

Shorelines would be planted with bahia or Bermuda grasses in combination with rye or millet. Select tree plantings would be undertaken also. Among the tree species considered for use in hydric areas would be cypress and blackgum; in transitional areas, red maple, sweetgum, and laurel oak; and in mesic areas, slash pine and dogwood. The final choice and distribution of plantings in land-and-lakes areas would be made with the intention of blending water areas with nearby undisturbed regions.

2.9.1.2 Environmental Considerations

The conventional reclamation alternative has both environmental advantages and disadvantages associated with its implementation. These are summarized below:

1. Environmental Advantages:
   - The post-reclamation land uses would be similar to uses on surrounding properties.
   - The deep lakes would serve as sediment entrapment basins and would thus help to contain erosion and sediment within the property boundary.
2. Environmental Disadvantages:
   - Post-reclamation elevations and topography would differ greatly from that found at present.
   - Above-grade clay disposal dikes would remain visible following reclamation.

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- Post-reclamation elevations and topography would alter surface water drainage patterns.
- Some floral and faunal species associated with wetlands would be lost if they could not become established in the land-and-lakes areas.
- Radioactivity levels in surface soils would be generally increased over present conditions.
- Soil fertility would not be conducive to agricultural land use in areas which were covered primarily with waste clay.

2.9.1.3 Technical Considerations

Scheduling of reclamation procedures for clay settling areas is fixed by the consolidation time required for adequate settling. Usually, a five to seven-year period is allowed for final surface crusting. This is followed by an additional five-year period of active reclamation involving further dewatering and consolidation procedures, grading and capping, and establishment of a plant covering.

Sand tailings fill and land-and-lakes areas require two years of reclamation time following mining of each area.

All disturbed areas on the MCC property would be economically restored to a productive state, considering both existing and created environmental systems. Approximately 7,500 acres of clay settling areas would be reclaimed to agricultural use. Land-and-lakes would comprise a total of 3,000 acres. An additional 1,000 acres of tails fill areas would be converted to general purpose areas.

2.9.2 Sand/Clay Mix Method

The sand/clay mix reclamation alternative includes clay settling, sand/clay mix fills, and land-and-lakes reclamation. Descriptions of these aspects of the reclamation plan and environmental and technical considerations of the sand/clay mix alternative are detailed in the following sections. As stated in Section 2.8, the sand/clay mix method is not technically practicable at the Hardee County mine because of the low ratio of sand to clay.

2.9.2.1 Method Description

Although the nominal ratio of sand to clay on the MCC property is 1.92 to 1, a substantial amount of sand is required for construction of dikes and for other purposes. This means that sand/clay fills having an average sand/clay ratio of only 0.75 to 1 would be placed in designated areas on the MCC property. Stage-filling would then occur in both above- and below-grade disposal areas. By using the stage-filling technique, a greater degree of structural stability can be achieved.

In below-grade storage areas, the sand/clay mixture would be deposited in three stages. After the initial fill has consolidated to 21 percent solids (after 3 years), a second fill (0.16 times the original fill volume) would be added. The final fill would be placed 8 years following the initial fill. Following subsidence, the area would be capped with a suitable capping material, bringing the area to a natural grade.

During the latter stages of mining (years 25 to 28), there would be time for only two stage-fillings. Because of these time constraints, the initial fill volume would require temporary retaining dikes. Three years after the initial fill was placed, a second fill would be added. Following consolidation of the second fill, the dikes would be graded over the fill, bringing the final elevation to natural grade.

In above-grade sand/clay fill areas, dikes constructed from overburden would be required to retain the fill. Five years after the initial fill, it is anticipated that these areas would have consolidated to 21 to 25 percent clay solids. At that time, a second fill (0.19 times the initial volume) would be added. Following consolidation of this fill to about 24 to 25 percent clay solids, excess dike material and other capping materials would be graded over the fill.

Soils resulting from this type of reclamation would have the potential for varied usage. Fertility would be improved over that of the clay soils, and tillage properties would be better due to inclusion of the sand tails. The type of plantings to be made would be decided at the time of final revegetation. Actual land uses would depend on site locations and associated conditions. Clay settling areas under the sand/clay mix plan would be similar to those described for the conventional method in Section 2.9.1.1. Differences between the plans would be related to the elimination and reduction of some clay settling areas. This would result in an increase in the areas allocated to various land uses.

Revegetation would be similar to that outlined for the conventional plan.

Land-and-lakes reclamation under the sand/clay mix alternative would be similar in methodology and in total acreage created to that described for the conventional reclamation alternative (Section 2.9.1.1). However, the depth of the lakes and their locations would be significantly different. Under this alternative, most land mined in the early stages of mine life would be returned to natural grade. Areas mined beginning in year 29 would become shallow lakes with sand-clay bottoms. Lakes created after this time would have a slightly greater depth due to the lack of fill material and the greater matrix depth.

Reclamation scheduling for clay settling areas is expected to be similar to that described for the conventional reclamation alternative (see Section 2.9.1.1). Most of the stage-filled sand/clay mix areas would require approximately nine years to be completed. During the latter stages of mining (years 25 to 28), there would be time for only two stage fillings; consequently, the time to complete reclamation activities would be reduced to seven years. Land-and-lakes reclamation areas would require from two to four years for reclamation.

2.9.2.2 Environmental Considerations

The advantages and disadvantages of the sand/clay mix reclamation alternatives, relative to conventional reclamation, are summarized below:

Advantages:

- This method would result in a better soil profile and increased fertility.
- More land would be reclaimed to natural grade.
- The land would be more structurally stable.
- This plan would require shorter reclamation time.
- Lakes areas would serve as sediment traps and provide wildlife habitat.
- Lakes would not be as deep as those in the conventional plan.
- Radioctivity levels in surface soils would be lower than with the conventional method.

Disadvantages:

- Above-grade disposal areas would remain visible after reclamation, with some areas still being as much as 40 to 45 feet above-grade.
- Surface water drainage patterns would be altered.
- Some marsh and wetland areas would be lost, with lake areas taking their place.

2.9.2.3 Technical Considerations

The primary technical considerations associated with the sand/clay mix alternative center around subsidence and material consolidation time, and the availability of the proper proportion of sand and clays on the MCC site.

Subsidence and material consolidation would be the same as that described for the conventional plan (see Section 2.9.1.3). Land uses for these areas would be restricted mainly to improved pasture. In sand/clay mix areas, the consolidation time is expected to be reduced from the time required for conventional settling (10 years or more) due to the inclusion of sand tailings. This is intended to shorten the time period after mining during which reclamation activities can be achieved. However, this method has not been used on a full scale project sufficiently long to determine if such rapid reclamation can actually be achieved. Increased dewatering of the mix is expected to result in a more structurally stable material which may support more intensive agriculture or other land uses. Land-and-lakes areas would be reclaimed by the same methods described for the conventional plan.

2.9.3 Conventional Method with a Sand/clay Cap (Proposed by MCC)

A variation on the conventional method is presented in this section. Under this plan, some clay settling areas would be capped with a sand/clay mix after the clays had consolidated; others would be partially capped with tails and overburden from the dikes (Table 2.8-1). Figure 2.9-1 shows the final contours expected after reclamation; Figure 2.9-2 shows the final expected land use/habitat configuration.

2.9.3.1 Method Description

The actual mixing method for the sand/clay capping material would be the same as that outlined in Section 2.9.2.1. Thickened clays would be dredged from a settling area for mixing with sand tails, and the mixture would then be pumped onto a conventional settling area (Figure 2.8-1). The capping mixture would be at an approximate 8:1 sand/clay ratio.

2.9.3.2 Environmental Considerations

The sand/clay cap reclamation method incorporates the same type of benefits as those generally associated with the sand/clay mix method. Because of the higher surface sand/clay ratio, capped areas would offer advantages for both land use and revegetation potential in comparison with uncapped clay storage areas. Generally, radioactivity levels would be lower for this method than for either of the two alternatives. The cap would enable the surface layer to be cultivated with more ease (compared with the conventional plan), while the clays would retain moisture for plant growth. Structural stability would be achieved at a faster rate than with the conventional method. Also, all benefits associated with the sand/clay mix reclamation method would be applicable for the sand/clay capping procedure, except that even faster settling and less acreage in above-grade storage areas would be realized at the MCC site.

In addition, the phosphate resource in most of the clay wastes would remain unmixed with sand and, therefore, available for future phosphate recovery as technology advanced.

One of the disadvantages inherent in this reclamation method is that only about 38 percent of the waste disposal areas would be capped with the sand/clay mixturc. The remainder would be covered with a combination of tailings and overburden. Also, reclamation could be delayed if the clays did not consolidate as rapidly as predicted.

2.9.3.3 Technical Considerations

The major technical consideration associated with this reclamation method is the timing of the cap placement. If the underlying clays have not consolidated sufficiently when the cap is placed, it could force the clays to rise up in places, thereby breaking the continuous sand/clay cap.

Final grading and revegetation can proceed at a faster rate once the cap has consolidated and dewatered.

2.9.4 Summary

The sand/clay cap method of land reclamation would approximate the advantages normally attributed to sand/clay mixing (which is infeasible for this site). Agricultural potential would be increased, and radioactivity levels would be reduced compared to conventional land-and-lakes reclamation. Less above-ground waste storage would be necessary. Topography and soils would be more adaptable to reclamation of wetlands. Only 3,700 acres of the land would be reclaimed at an elevation above natural grade.

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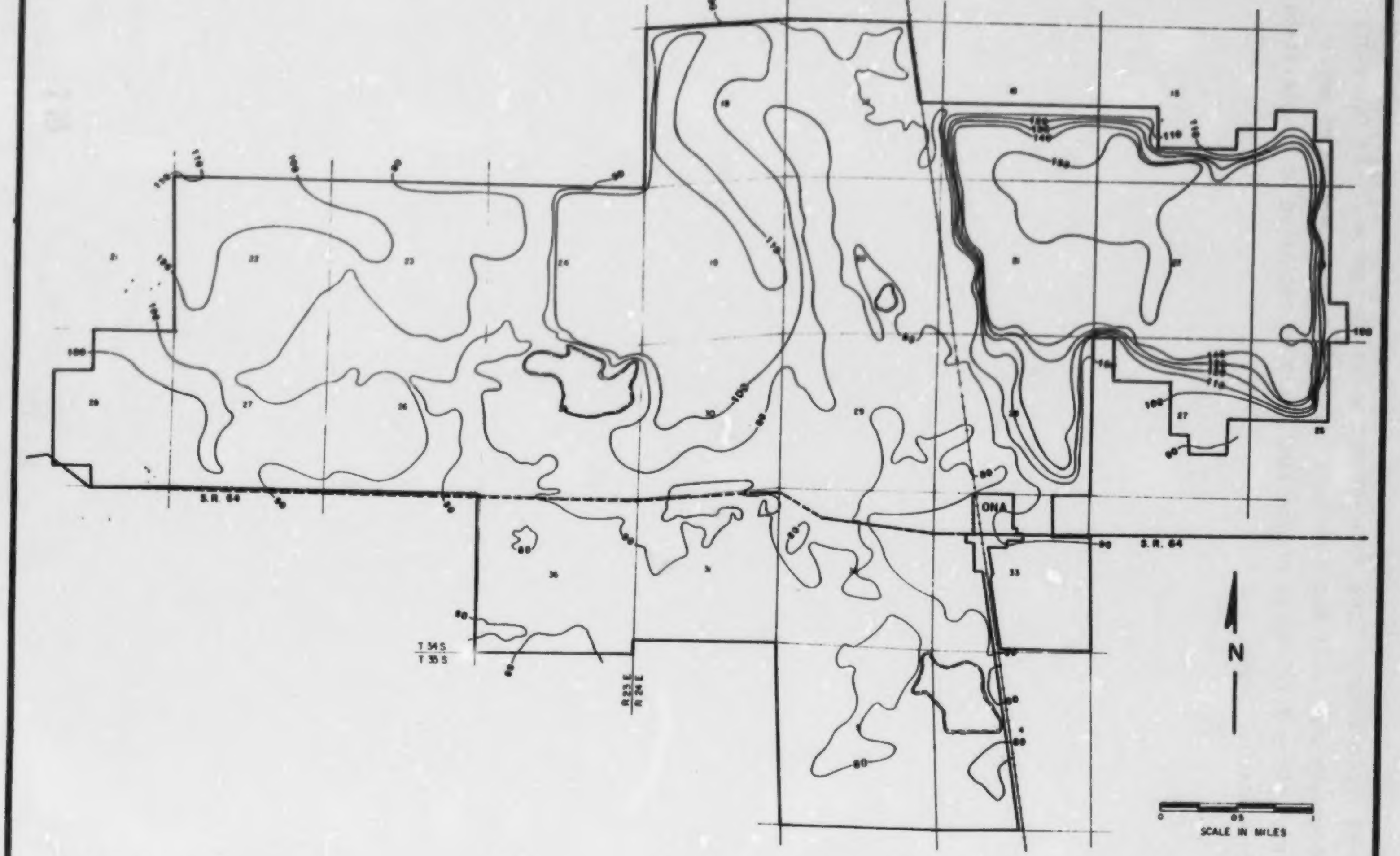

S.R. 64
ONA
N
SCALE IN MILES
0
0.5
1
T 34 S
T 35 S
R 23 E
R 24 E

SOURCE: MCC, 1977.

Figure 2.9-1. Final Reclamation Contours of MCC Site.

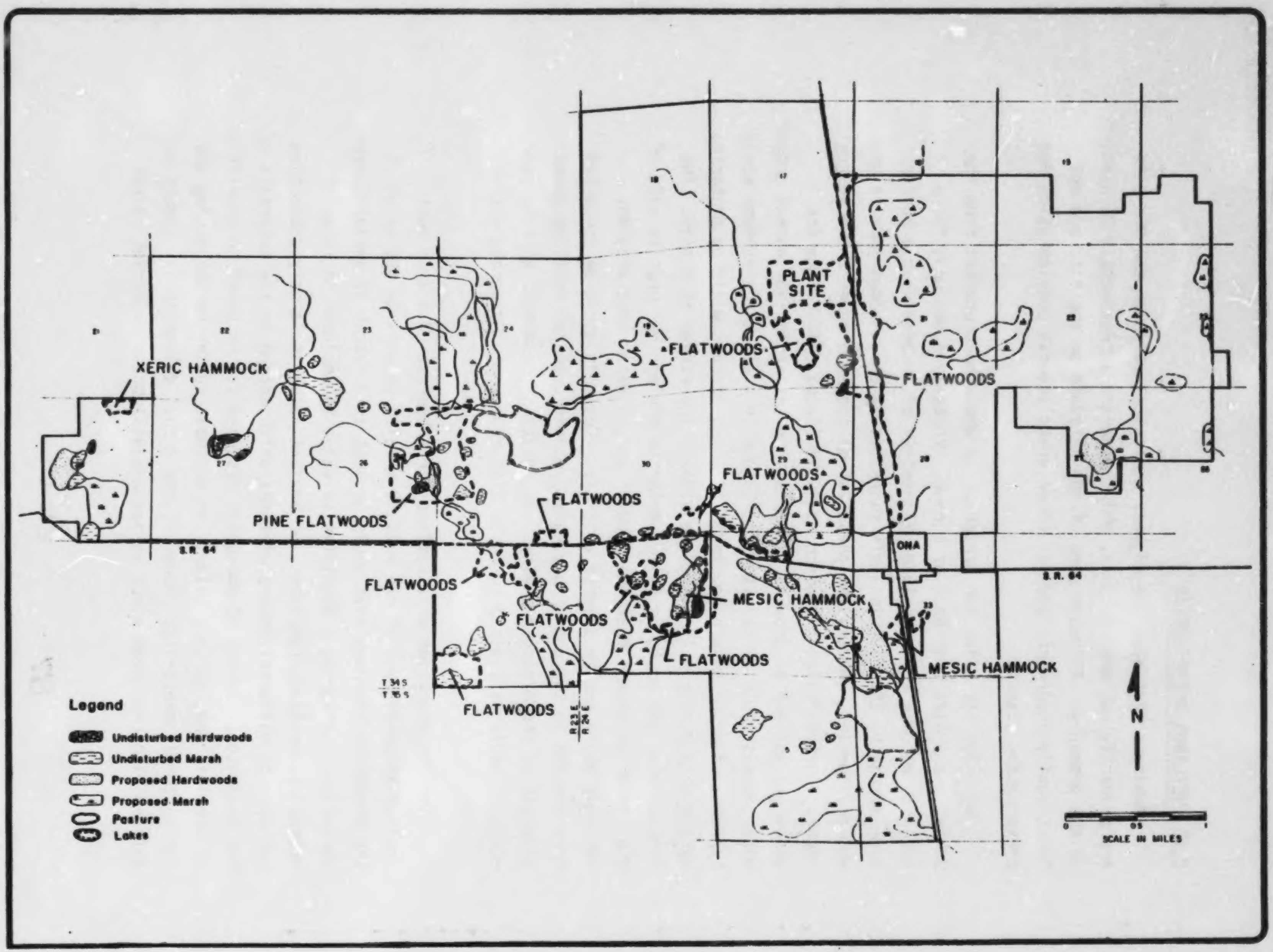

XERIC HAMMOCK
PINE FLATWOODS
FLATWOODS
FLATWOODS
FLATWOODS
FLATWOODS
FLATWOODS
FLATWOODS
FLATWOODS
FLATWOODS
PLANT SITE
MESIC HAMMOCK
MESIC HAMMOCK
ONA
S.R. 64
S.R. 64
T 34 S
T 35 S
R 23 E
R 24 E
N
0
0.5
1
SCALE IN MILES
Legend
Undisturbed Hardwoods
Undisturbed Marsh
Proposed Hardwoods
Proposed Marsh
Pasture
Lakes

Figure 2.9-2. Expected Final Land Use on MCC Site.

2.10 WETLANDS PRESERVATION

Habitats that have the highest ecological value on the MCC site are primarily wetlands systems, which comprise approximately 25 percent of the property. Although some of the wetlands on the site are not functionally important, several other areas deserve consideration for preservation status.

Wetlands set aside for preservation would be protected from the direct and indirect effects of mining. Protective measures for a specific wetland would include delineation of a non-mineable buffer zone averaging 250 feet in width to reduce water drawdown impacts on wetland species. During the phases of mining when water drawdown could occur, a water-filled rim ditch would be placed adjacent to the protected wetland to provide a hydraulic gradient so that normal ground water levels could be maintained. Except in areas where streams would be rerouted prior to mining, wetlands along streams would be protected by actively mining only along one side of the stream at a time. The initial mine pit would be filled prior to mining the opposite side of the stream to assure that the flow of ground water into adjacent wetlands would not be severed entirely. Wetlands would be protected from erosion by the use of hay bales, screens, and/or settling ponds adjacent to the mining activity. In addition, personnel working near wetlands would be trained to avoid disturbance of indigenous wetland species.

The consideration of a wetland for preservation status must include an assessment of the wetland's value as well as the value of the phosphate reserves that would be lost as a result of wetlands preservation. Assigning a quantitative value to wetlands in terms of economics, wetlands functions, or habitat value is largely subjective and open to different interpretations which depend on the interests of the evaluator. Values of phosphate reserves can be based on quantities of ore lost and, to some extent, on economic losses to the mining and agricultural industries. However, the actual dollar losses cannot be defined with precision since variations will occur in market values during the years when the ore would be mined. A comparison of losses in wetlands values versus losses in reserves, therefore, is difficult because of the inability to quantify the wetlands value in a manner similar to that for phosphate reserves.

To evaluate the impacts of mining or otherwise disturbing wetlands versus the economic impacts of preserving these habitats, four wetlands preservation alternatives were compared. The proposed mining plan and waste storage plan were then overlain on each preservation scheme to determine both the acreage of wetlands that would be lost if the plans were implemented as well as the economic losses (in terms of tons of phosphate ore) which would be sustained by MCC if the preservation schemes were imposed.

The four wetland preservation alternatives considered are illustrated on Figures 2.10-1 through 2.10-6. The alternative wetland preservation/reclamation plans considered were: 1) the wetlands protected under the Florida Development Order, which was issued by Hardee County and approved by the Florida Land & Water Adjudictory Commission; 2) the USEPA's wetland categorization plan, classifying MCC wetlands using the general guidelines for regional wetlands protection and restoration as defined in the Central Florida Phosphate Industry Areawide Impact Statement (USEPA, 1978); 3) a site-specific application of the USEPA categorization plan; and 4) a wetlands systems preservation plan. Wetlands preservation, according to each of these alternative plans, affords a different set of ecological and hydrologic functions, based on the size and complexity of the ecosystem and the association of the system with flowing water bodies and floodplains.

The actual area of land and volume of ore lost to MCC as a result of preserving specific wetlands depends on the size of the area and the position of the area in the overall mining sequence. Preserving several small wetlands would result in a greater loss of mining area (because of buffer zones and dams that must be provided to protect the wetlands) than would preservation of a single wetland of similar total area.

Although some wetlands may be set aside by the USEPA as protected or preserved so that they will not be disturbed by mining activity, the USEPA has also recognized the possibility that reclamation technology may proceed to the extent that fully functional wetlands can be restored. Therefore, the USEPA may re-evaluate the areas placed in preservation status and remove some or all restrictions on mining in these areas. Such a decision would be based on the assurance that the important functional roles of the wetlands approved for mining are being, or have been, replaced by ongoing reclamation projects conducted by MCC.

2.10.1 Wetlands Preserved and Restored Under the Hardee County Development Order (Proposed by MCC)

2.10.1.1 Plan Description

This alternative has been approved by Hardee County and the Florida Land and Water Adjudicatory Commission in a Development Order, Resolution Number 78-10, finalized March 17, 1981. This Development Order requires the demonstration of an ability to restore wetlands prior to mining of specified areas shown on Figure 2.10-1.

Under this plan, six individual, experimental wetlands would be constructed on the MCC property, each approximately one acre in size. Three of these would be designed to become hardwood swamps and three to develop into fresh water marshes. Following clearing and excavation, these wetlands would be developed to the functional equivalent of the undisturbed wetlands on the site. Functional equivalency would be determined by comparison with six model wetlands on the site, which would be studied in detail to evaluate the following parameters: vegetative composition, vegetative structural complexity, vegetative productivity, litter weight, litter depth, bird density and diversity, mammal density and diversity, water quality, and hydrological characteristics. If the parameters measured in the model wetlands were found to be similar to those measured in the experimental plots, or if a progression of these parameters towards values found in the model was evident, then mining of the following, previously-preserved areas (Figure 2.10-1) would be allowed:

- A 57-acre hardwood swamp in Section 29;
- A 112-acre fresh water marsh in Sections 32, 33, 4, and 5; and
- A 64-acre hardwood swamp in Section 17.

Using information gained from the wetlands restoration pilot project, MCC would create hardwood swamps and fresh marshes in the areas shown on Figure 2.10-7. Approximately 390 acres of hardwoods and 1,620 acres of marsh would be restored to replace wetlands lost through mining activities. Restoration of stream flows and beds would also be included under this plan. A summary of wetlands affected by this plan is provided in Table 2.10-1.

2.10.1.2 Environmental, Technical, and Economic Considerations

As Table 2.10-1 shows, 440 acres of wetlands would be unaffected by mining operations (Column B) throughout the mine life. An additional 233 acres (Column C), containing 6.71 million tons (Column D) of phosphate ore, would be placed into preservation status and could be mined or used for clay storage only if the proposed demonstration project successfully illustrated MCC's ability to restore equivalent, functional wetlands. If the proposed mining plan is approved to allow mining and clay storage in the 233 acres of preserved wetlands, then MCC would disturb a total of 2,540 acres (Column E) of wetlands, and by the end of the mine life, would reclaim a total of 2,010 acres (Column F). This would result in a post reclamation total of 2,450 acres of wetlands (Column G) on the MCC site (440 acres of unaffected wetlands plus 2,010 acres of reclaimed wetlands).

If wetland restoration progressed as proposed under this plan, then an increase in overall habitat quality and value would result for the MCC property following mining activities. The environmental advantages that would be realized from this proposed mining/reclamation program include:

1) Increased contiguities between wetlands and site streams; decreased acreages of isolated wetlands currently located along these streams (Figure 2.10-7);

2) Enhanced stream physiography; sloping banks and meandering stream beds would replace existing, channelized streams; and

3) Development of a research-level data base for wetlands and stream reclamation.

The environmental disadvantages of implementing this preservation plan include:

1) A net decrease of 465 acres of marshes and 65 acres of swamps; and

2) A period of approximately 8 years (years 20-28, Figure 2.10-8) during which the total wetlands on the site would be reduced by about 50 percent.

2.10.2 USEPA Areawide Categorization of Wetlands (Alternative)

2.10.2.1 Plan Description

The final Central Florida Phosphate Industry Areawide Impact Assessment (USEPA, 1978) stated that the loss of wetlands was an important impact resulting from mine construction activity. Therefore, it was recommended that those wetlands with high functional value (with emphasis on floodplain wetlands) be protected from development. A wetlands categorization system was developed to serve as a guideline for regulating the mining and reclamation of wetlands on new source mine sites. This system characterizes wetlands in three categories (USEPA, 1978):

Category I -- Protected

> "...wetlands within and contiguous to rivers and streams having an average annual flow exceeding 5 cubic feet per second (cfs) as well as other specific wetlands determined to serve essential environmental functions, including water quality (these are wetlands

> that provide an essential synergistic support to the ecosystem ecosystem and that would have an unacceptable adverse impact if they were altered, modified, or destroyed). This generally includes cypress swamps, swamp forests, wet prairies, and certain fresh water marshes."

Category II - Mine and Restore

> "...wetlands that should be restored as wetlands to perform useful wetland functions. This also includes certain isolated noncategory wetlands that serve a primary function or several minor functions that may be maintained through proper restoration."

Category III - Mine with No Restoration to Wetlands

> "...wetlands that would not have to be restored as wetlands. These are isolated and normally intermittent in nature, have less significant hydrological functions than Category II, and minimal life-support value."

By protecting wetlands which are closely associated with major streams (greater than 5 cfs mean annual flow), the important functions of water quality enhancement, flood control potential, and wildlife habitat are preserved. The USEPA approach was developed as a broad, conceptual categorization scheme to protect the nation's waters, particularly in the seven-county phosphate region of central Florida. As such, it did not address individual wetlands on a site by site basis. It was recognized that some modifications would be necessary for specific mine sites.

Figures 2.10-2, 2.10-3, and 2.10-4 illustrate the wetlands on the MCC site within each of the three USEPA categories, as strictly defined in the Areawide EIS. Acreages of wetlands in each category that would be affected directly or indirectly by the proposed mining and clay storage plan are shown in Table 2.10-1.

2.10.2.2 Environmental, Technical, and Economic Considerations

This preservation alternative is characterized by the same environmental advantages as the proposed action (Section 2.10.1), except considerably more area is preserved under this alternative (1,060 acres) than under the proposed plan (233 acres). If not made available for mining, loss of the 1,060 acres of preserved wetlands would render approximately 30 million tons of phoshpate ore (Column D) unrecoverable. This plan provides comprehensive protection of floodplain wetlands, many of which, however, are small and not naturally contiguous to flowing water bodies.

MCC's proposed mining and reclamation plan would disturb 958 acres of protected Category I wetlands and would later increase these Category I wetlands from 1,060 acres (Column A) to 1,435 acres (Column G). This increase would be largely the result of MCC's proposal to develop wetlands contiguous to Brushy and Oak Creeks.

2.10.3 Site-Specific Application of USEPA Criteria (Alternative)

2.10.3.1 Plan Description

This wetlands classification scheme was based on site-specific application of the broad wetlands categorization described in Section 2.10.2 This site-specific application would preserve those wetlands of high functional and/or habitat value and would place into USEPA Category II those wetlands which had a relatively low ecological value due to their isolation or their connection with 5 cfs streams only by manmade canals. On the other hand, wetlands which were not within the 25-year floodplain but were structurally unique or functionally important would be classified as Category I and would be preserved under this scheme.

The wetlands on the MCC site that would be classified as Category I under this alternative are shown on Figure 2.10-5. Acreages of wetlands in each category on the MCC site, using this site-specific approach, and acres affected by the proposed mine and reclamation plan are listed in Table 2.10-1.

Categorization of MCC site wetlands by the site-specific scheme results in an overall reduction of Category I wetlands and a proportional increase in acreage of Category II wetlands (compared to the areawide categorization alternative in Section 2.10.2). Major wetland areas that are excluded from preservation by this method include wetlands in the 25-year floodplain between Oak and Brushy Creeks (Figure 2.10-2, Sections 30, 31, and 32), which are infrequently flooded by Oak Creek due to the historical rerouting of the mainstream channel. These wetland areas, which are not direct components of the normal, cyclical, hydrological regime of the Oak Creek floodplain, are not as functionally important as those which are more directly connected with the main Oak Creek stream. Following mining, restoration of wetlands in locations which are geographically, as well as hydrologically, more closely related to existing stream channels (as planned) would enhance the overall floodplain value compared to present conditions.

Most of the remaining wetlands excluded from the broader application of the areawide characterization scheme by this site-specific application are those wetlands which are located within the normal 25-year floodplain boundaries of Brushy Creek but are isolated from the mainstream channel (Figure 2.10-2).

2.10.3.2 Environmental, Technical, and Economic Considerations

The environmental advantages described for the proposed action (Section 2.10.1) would also be realized as a result of the institution of this preservation plan.

As indicated in Table 2.10-1, this site-specific alternative would result in 233 acres (Column C) of wetlands being preserved or protected (in additon to the 440 acres listed in Column B which would be unaffected by mining) and the consequent loss of 6.71 million tons of phosphate ore.

If mining and waste storage were eventually allowed in these wetlands, the total wetlands classified as Category I after restoration would increase from 233 to 1,433 acres (Column G). As part of a restoration project distinct and separate from, but in addition to, the restoration program identified in the Hardee County Development Order (Section 2.10.1), a program to create 90 acres of wetlands in historically wet areas would be conducted. Parts of Section 32, T34S-R24E and Section 31, T34S-R24E have been identified as potential sites for this program (Appendix A).

Soil structure is an essential element of wetland systems but has been difficult to establish in restoration projects. However, historically wet areas should have the appropriate soil characteristics and therefore could substantially add to wetland restoration knowledge and technology. Since there are many drained wetlands throughout the phosphate district, this type of restoration project would be essential for mitigation of past and potential future losses of wetlands. The extensively altered hydrologic character of the MCC property provides suitable sites for conducting a study of this nature.

2.10.4 Wetlands Systems (Alternative)

2.10.4.1 Plan Description

Protection of wetlands as components of important systems would preserve not only individual wetlands that have water quality enhancement potential, flood control capability, and/or good fish and wildlife value, but would also preserve non-wetland components that comprise larger systems with high diversity and ecological interaction with adjacent wetlands.

Five major wetlands systems on the MCC site were identified for preservation; these are shown on Figure 2.10-6. Some of the wetlands which were classified as Category I and Category II, using the site-specific USEPA approach, were included in these systems. This method assumes that the presence of mesic hammock between and surrounding certain wetlands enhances their overall ecological value, based on the interactions between upland and wetland habitats (see Section 3.2.3).

Using the wetlands systems preservation approach, the wetlands that are not shown as Category I on Figure 2.10-6 or Category III on Figure 2.10-4 would be considered as Category II (mine and restore) wetlands. Acreages within these three categories on the MCC property using this systems preservation plan, and acres of wetlands affected by the proposed action, are illustrated in Table 2.10-1.

2.10.4.2 Environmental, Technical, and Economic Considerations

Table 2.10-1 illustrates that this alternative preservation plan would result in preservation of 720 acres of wetlands (1,007 acres of Category I ecosystem less 287 acres of mesic hammock), with a total loss to MCC of 29 million tons (Column D) of phosphate ore. If mining and reclamation were to proceed as proposed, the total area of Category I wetland systems on the site would be increased to 1,357 acres (Column G).

Four of the five wetland areas preserved under this plan would comprise a significant portion of the Oak Creek drainage system. Protection of these areas would preserve the wetlands that are integral components of the Oak Creek ecosystem (Figure 2.10-6). Although portions of Systems D and E (Figure 2.10-6) would be preserved by the areawide USEPA approach, Systems B and C would not be preserved since they are not within the 5 cfs floodplain of Oak Creek. Preservation of Systems B and C would protect areas that are structurally diverse, relatively large, and highly productive. Although the flow of these systems is usually less than 1 cfs, periodic flushing probably contributes nutrients to enhance downstream productivity.

Using this preservation scheme, the wetlands that are recognized as part of System A in the northern portion of Brushy Creek on the MCC site (Figure 2.10-6) would be the only wetlands of significance placed under preservation status on Brushy Creek. Many of the wetlands classified as Category I under the USEPA preservation alternative would be excluded from preservation status under this plan. This is primarily because of their small size and the high degree of disturbance by channelization and agriculture along Brushy and Oak Creeks. However, many wetlands that would have been placed in Category II under the USEPA scheme, because of their location outside of the floodplain or location on streams with less than 5 cfs flow, would be given preservation status under the systems approach. This change in status results because, under a systems preservation scheme, these areas would be protected primarily as integral parts of the wetland system watershed. In addition, the presence of mesic hammock interlaced between these wetlands would enhance the overall wildlife value of the ecosystem.

2.10.5 Summary

Of the four wetlands preservation plans, the maximum acreage would be protected by direct application of the USEPA Areawide EIS categories, and the least by MCC's and the USEPA's site specific proposal (Table 2.10-1). The wetlands systems plan would preserve wetlands with the greatest functional value on the site. The areal extent of present site wetlands with high functional value is indicated by the reduction in acres of wetlands (from 1,060 to 233 acres) remaining in Category I when site specific functional values are considered. The amount of ore reserves lost by preserving wetlands according to these plans ranges from 6.71 million tons for MCC's and the USEPA's site specific proposal to 30 million tons for the USEPA areawide categorization. Another major difference between the plans is that all wetlands to be preserved under the proposed preservation plan and sitespecific wetland plan occur in areas unaffected by mining or waste disposal until 17 or more years after mining activity begins. This delay in affecting these wetlands means that time is available for MCC to demonstrate that these wetlands could be reclaimed and, therefore, there is a chance the 6.71 million tons of phosphate reserve could still be recovered. In contrast, the other two preservation plans include some wetlands which are planned to be mined or receive waste clays early in the mine life. Insufficient time would be available to demonstrate reclamation feasibility; a minimum loss of 3.14 million tons of phosphate reserves would occur, with no chance for future recovery of the ore. There is, of course, no guarantee that any of the phosphate reserves listed in Column D of Table 2.10-1 could ever be recovered since mining activity in these areas would require demonstration that reclamation of wetland functions could be achieved.

MCC's plans for wetlands reclamation are also shown on Table 2.10-1. A total of 2,010 acres would be reclaimed, including 390 acres of swamp and 1,620 acres of marsh. Including wetlands unaffected by mining operations (440 acres), post-reclamation wetlands would total 2,450 acres, or 82 percent of present wetland acreage. The reclaimed wetlands are expected to have greater functional value than do present wetlands since existing wetlands are mostly isolated or connected only by channelized drainage ditches. This is reflected in the fact that total post-reclamation wetlands acreage in Category I is substantially greater than present Category I wetlands acreage for any of the wetland preservation plan categorizations (Table 2.10-1). Thus, reclamation is expected to provide a shift from Category II and III wetlands to Category I wetlands.

From an environmental perspective, the preferred preservation plan would be the wetlands system plan, which provides maximum protection to functioning wetlands systems. The MCC and USEPA site specific proposals protects the least amount of wetlands acreage. However, the wetlands system plan would potentially eliminate 31 percent of the economically recoverable phosphate reserves from mining, including 3.14 million tons with a present net value of $93.4 million which could not be recovered subsequently even if reclamation were proven to be possible. The USEPA areawide categorization plan would also eliminate the same 3.14 million tons due to protection of these same wetlands. The proposed preservation plan protects the wetlands system on Oak Creek which contributes the most to water quality enhancement on the site. Maximum losses in phosphate reserves would be 6.71 million tons, all of which could potentially be recovered if reclamation were demonstrated to be possible.

An additional aspect of the site-specific categorization plan is that an experimental restoration program would be pursued to demonstrate the ability of creating wetlands in historically wet areas. This program would add an additional 90 acres of wetlands to the total proposed for restoration by MCC.

TABLE 2.10-1

PRESERVATION ALTERNATIVES[a]

Page 1 of 2

	Alternative Wetlands Preservation Plans				Wetland Effects of MCC's Proposed Mining Reclamation Activities[b,c]		
	A	B	C	D	E	F	G
	Wetlands On Site	Wetlands Unaffected by Mining Operations	Wetlands Protected Under Preservation Plan	Ore Reserves Lost Under Preservation Plan	Wetlands Disturbed	Wetlands Reclaimed	Total Post Reclamation Wetlands (Columns B & F)
Proposed by MCC (Figure 2.10-1)							
Habitat							
Swamp	490	35	120	3.57	455	390	425
Marsh	2,490	405	113	3.14	2,085	1,620	2,025
Total	2,980	440	233	6.71	2,540	2,010	2,450
USEPA Areawide Categories (Figures 2.10-2, 2.10-3, and 2.10-4)							
Category							
I	1,060[d]	102	1,060	30	958	1,333[e]	1,435
II	1,538	165	-	-	1,373	677	842
II	382	173	-	-	209	-	173
	2,980	440	1,060	30	2,540	2,010	2,450
Site-Specific Application of USEPA Areawide Categories (Figure 2.10-5)							
Category							
I	233	100	233	6.71	130	1,333[e]	1,433
II	2,358	160	-	-	2,201	677	837
III	389	180	-	-	209	-	180
	2,980	440	233	6.71	2,540	2,010	2,450
Wetlands Systems Categories (Figure 2.10-6)							
Category							
I	1,007[d]	24	1,007	29	980	1,333[e]	1,357
II	1,871	236	-	-	1,351	677	913
III	389	180	-	-	209	-	180
	3,267	440	1,007	29	2,540	2,010	2,450

[a] All numbers are in acres (approximate), except Column D which is in millions of tons.

[b] Data in these columns represent effects of MCC's planned mining and reclamation activities (as approved by the Florida Development Order) on the various categories of wetlands defined in each preservation plan. MCC's plan assumes mining and subsequent reclamation of wetlands listed in Column C in order to recover the reserves listed in Column D.

[c] Includes Category I and 25 percent of Category II.

[d] Includes 287 acres of mesic hammock.

[e] Categories of wetlands reclaimed are based on the classification system presented in the Central Florida Phosphate Industry Areawide Impact Statement (USEPA, 1978).

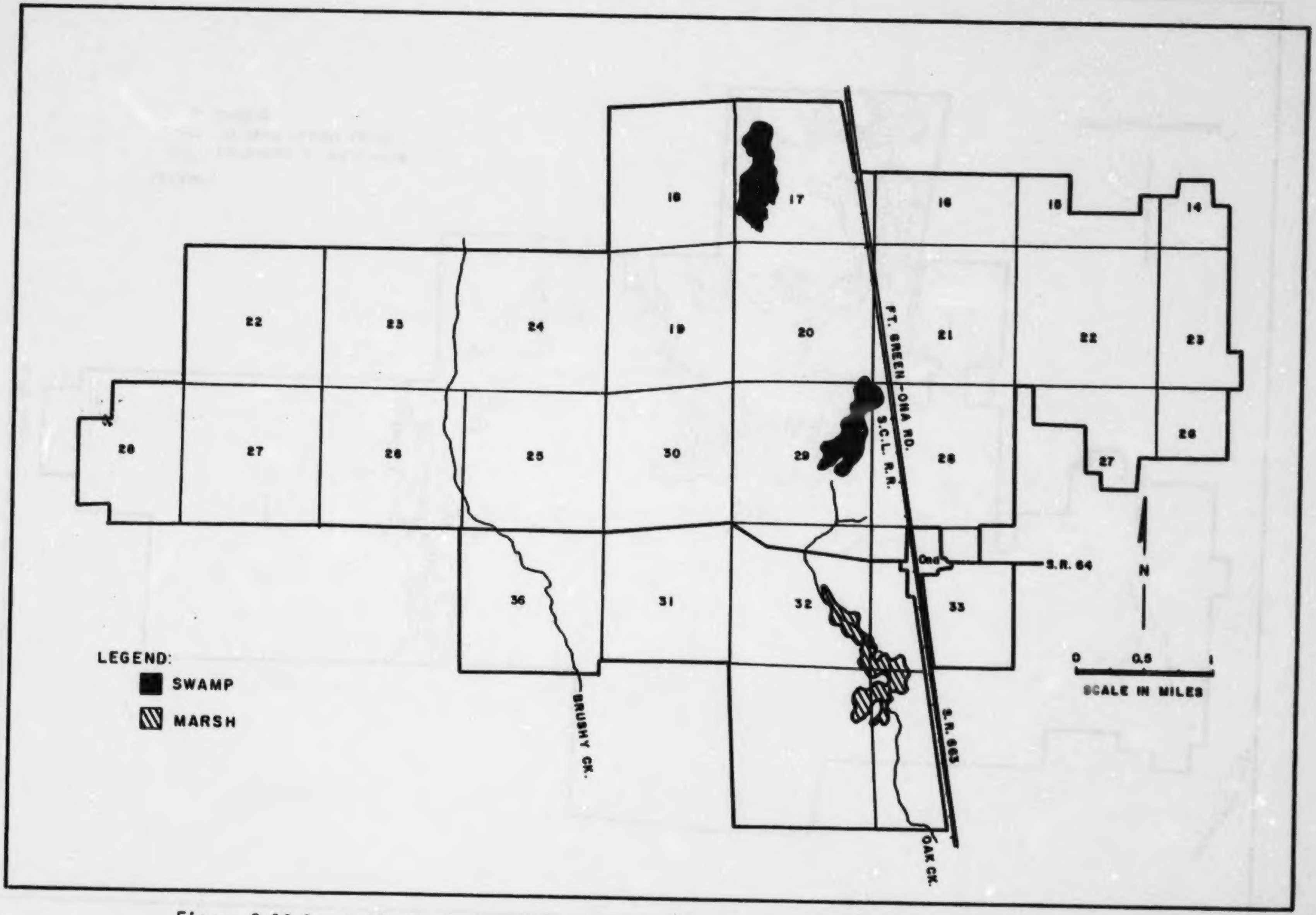
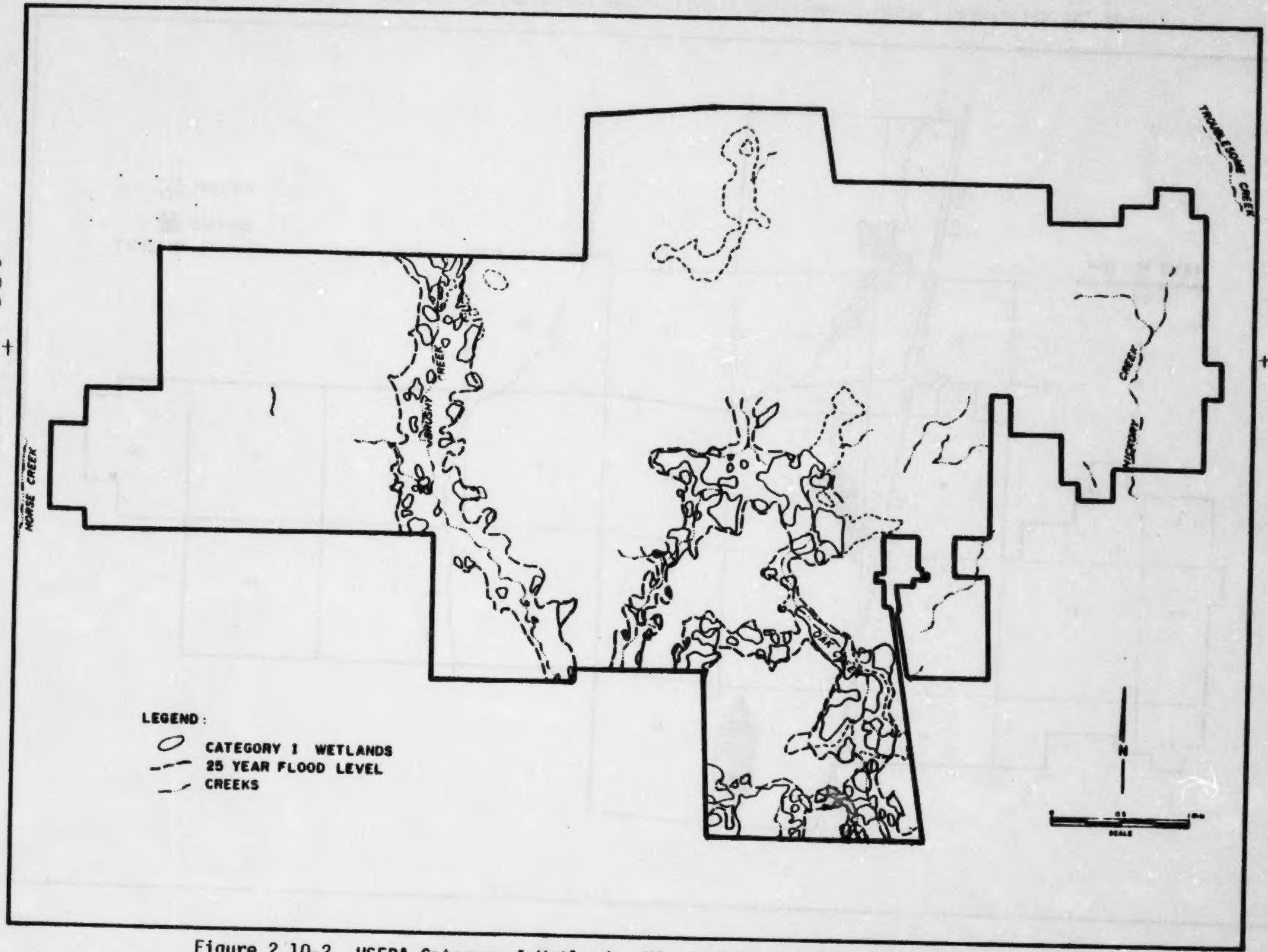

16
17
16
15
14
22
23
24
19
20
21
22
23
28
27
26
25
30
29
28
27
26
36
31
32
33
FT. GREEN-ONA RD.
S.C.L. R.R.
S.R. 64
S.R. 663
Ona
BRUSHY CK.
OAK CK.
N
0
0.5
1
SCALE IN MILES
LEGEND:
SWAMP
MARSH

Figure 2.10-1. Wetlands Protected by Hardee County Development Order, Resolution No. 78-10.



TROUBLESOME CREEK
HICKORY CREEK
OAK
BRUSHY CREEK
HORSE CREEK
N
0
0.5
SCALE
LEGEND:
CATEGORY I WETLANDS
25 YEAR FLOOD LEVEL
CREEKS

Figure 2.10-2. USEPA Category I Wetlands, Mississippi Chemical Corporation.

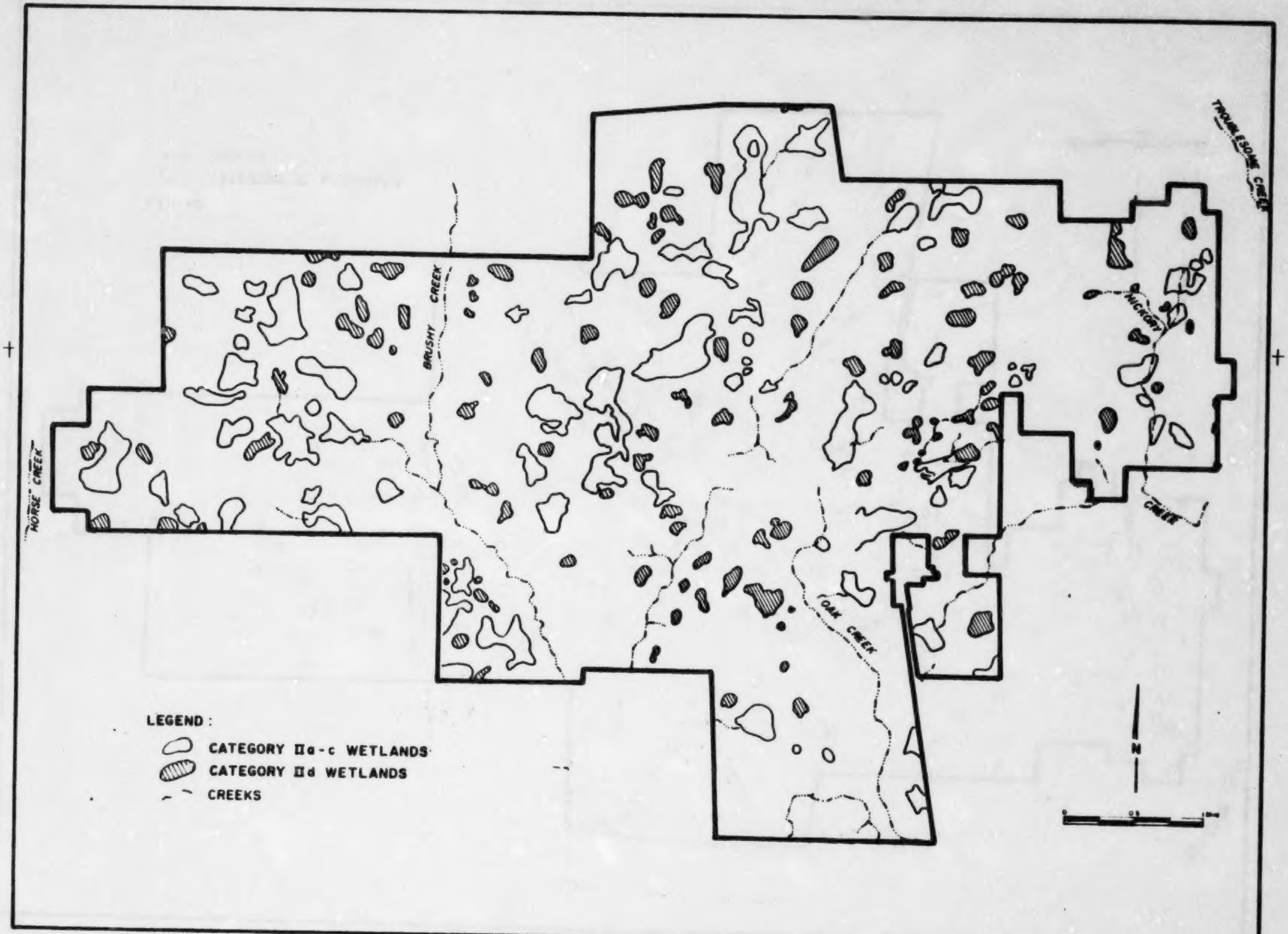

TROUBLESOME CREEK
HICKORY
CREEK
BRUSHY CREEK
OAK CREEK
HORSE CREEK
N
0
0.5
LEGEND:
CATEGORY IIa-c WETLANDS
CATEGORY IId WETLANDS
CREEKS

Figure 2.10-3. USEPA Category II Wetlands, Mississippi Chemical Corporation.

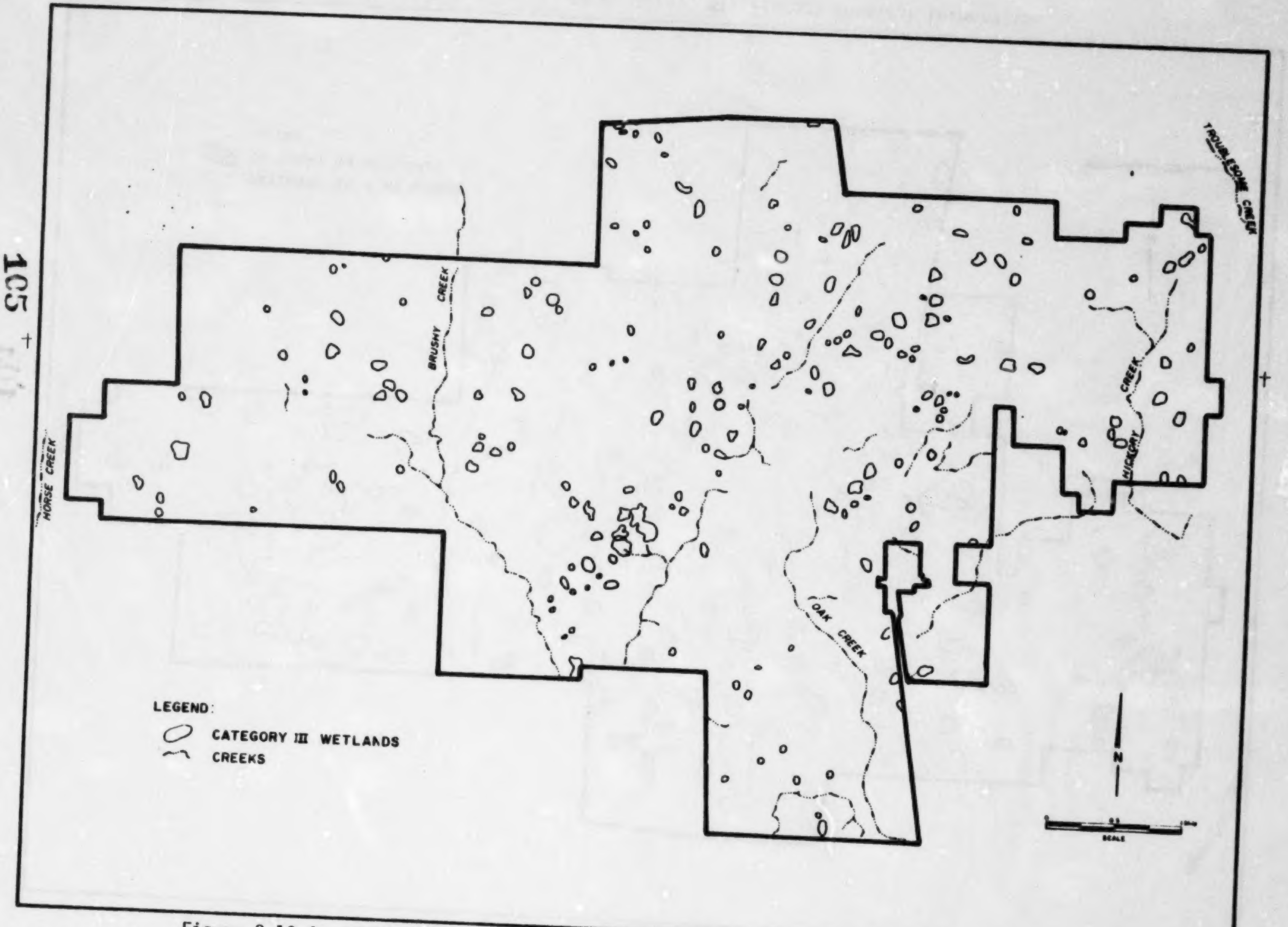

TROUBLESOME CREEK
HICKORY CREEK
OAK CREEK
BRUSHY CREEK
HORSE CREEK
N
SCALE
LEGEND:
CATEGORY III WETLANDS
CREEKS

Figure 2.10-4. USEPA Category III Wetlands, Mississippi Chemical Corporation.

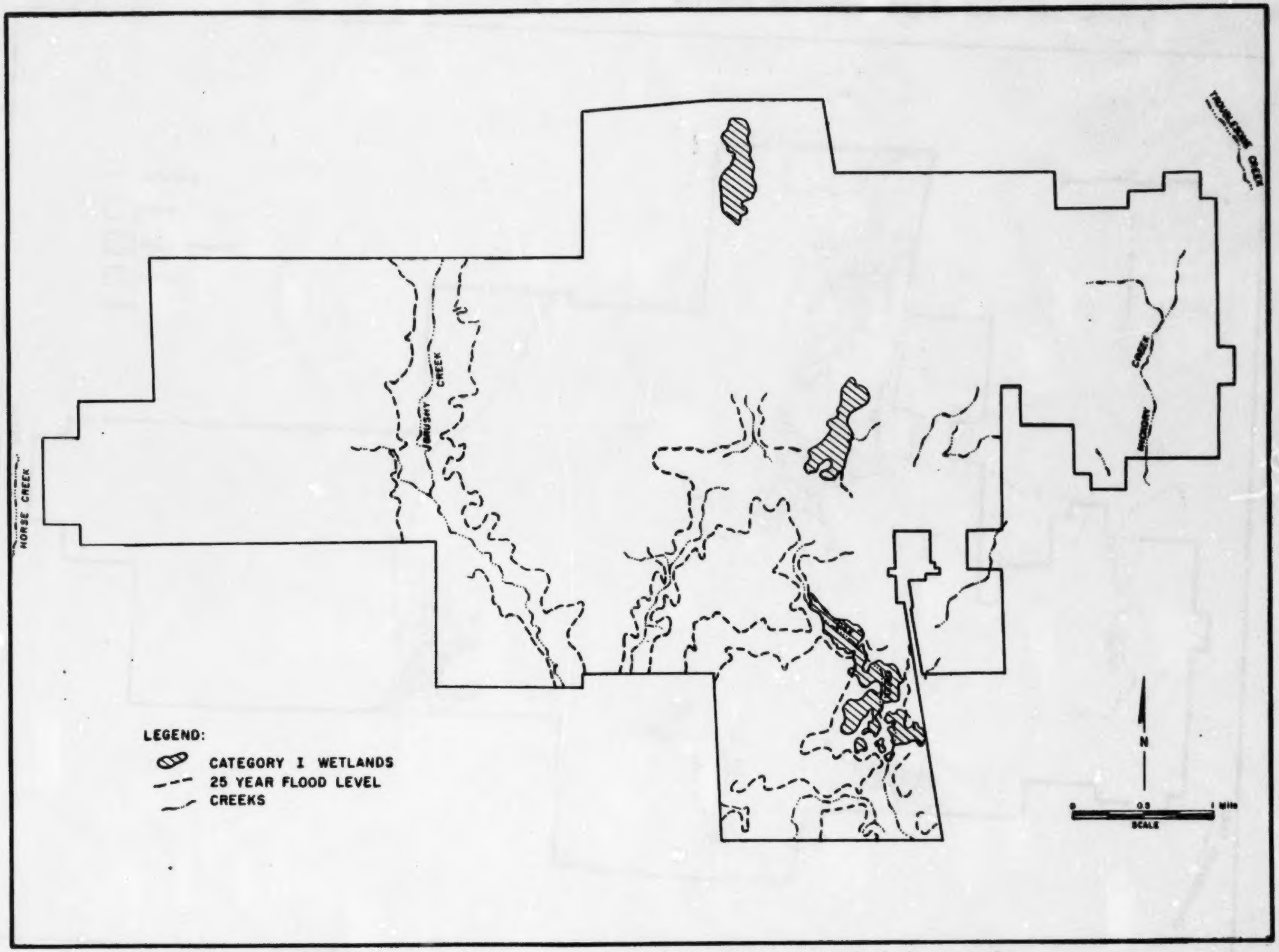

TROUBLESOME CREEK
HICKORY CREEK
BRUSHY CREEK
HORSE CREEK
N
0
0.5
1 Mile
SCALE
LEGEND:
CATEGORY I WETLANDS
25 YEAR FLOOD LEVEL
CREEKS

Figure 2.10-5. Site Specific Category I Wetlands, Mississippi Chemical Corporation.

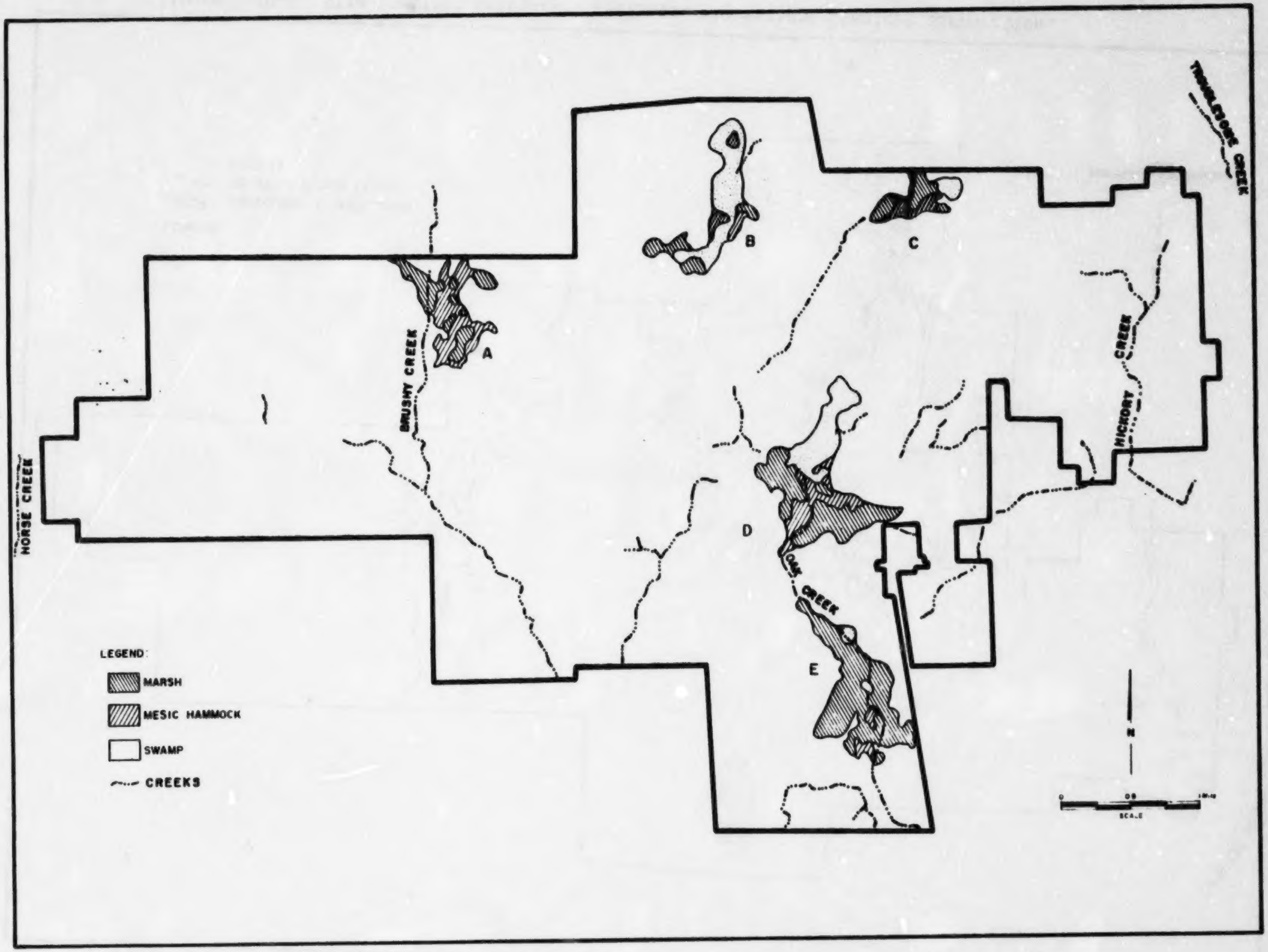

TROUBLESOME CREEK
HICKORY CREEK
BRUSHY CREEK
OAK CREEK
HORSE CREEK
A
B
C
D
E
LEGEND:
MARSH
MESIC HAMMOCK
SWAMP
CREEKS
N
0
SCALE

Figure 2.10-6. Functionally Important Wetlands Systems on MCC Property. (Category I, Table 2.10-1)

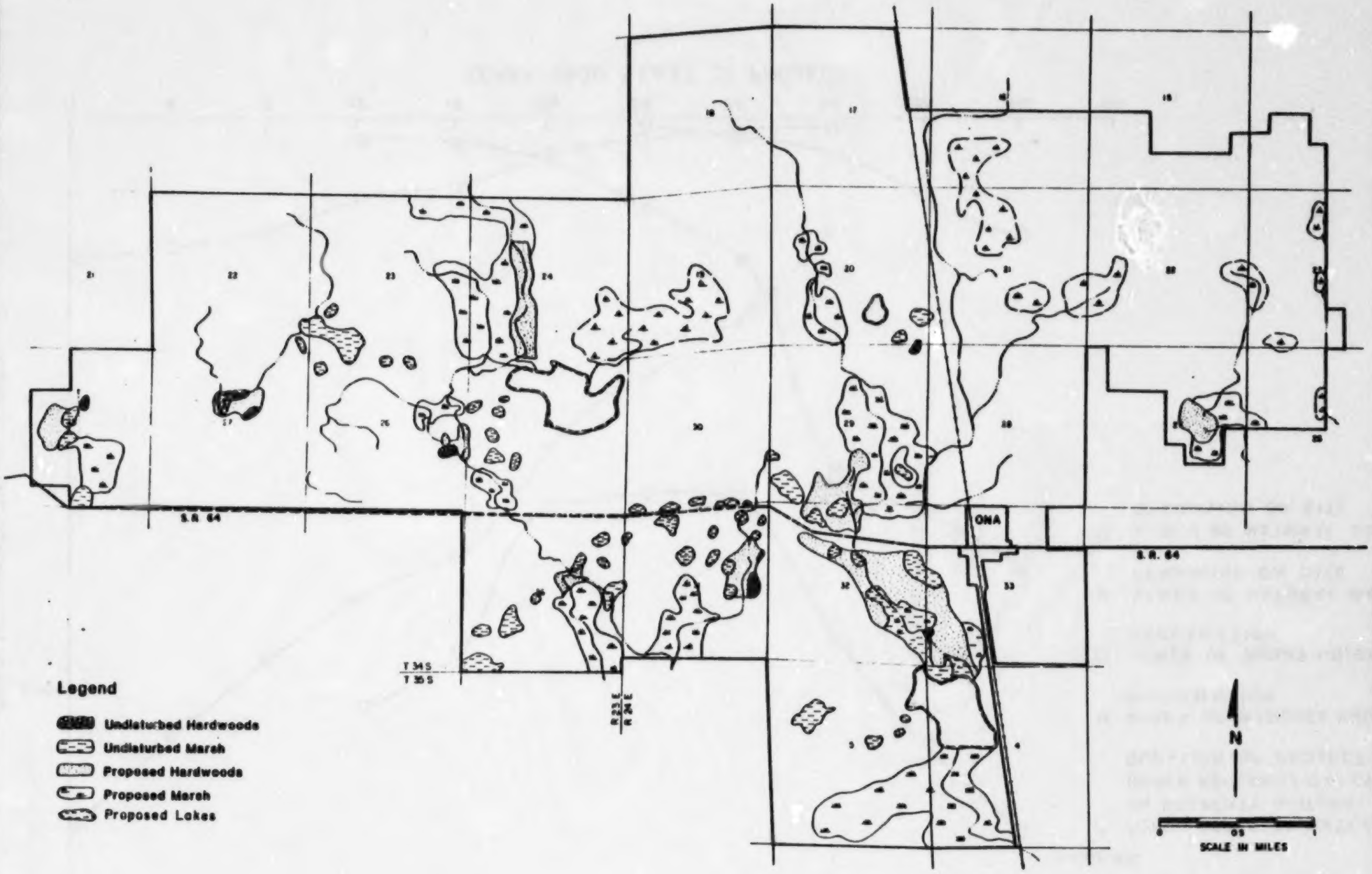

Legend
Undisturbed Hardwoods
Undisturbed Marsh
Proposed Hardwoods
Proposed Marsh
Proposed Lakes
S.R. 64
S.R. 64
ONA
T 34 S
T 35 S
R 23 E
R 24 E
N
0
0.5
1
SCALE IN MILES

Figure 2.10-7. Proposed Final Wetlands Configuration.

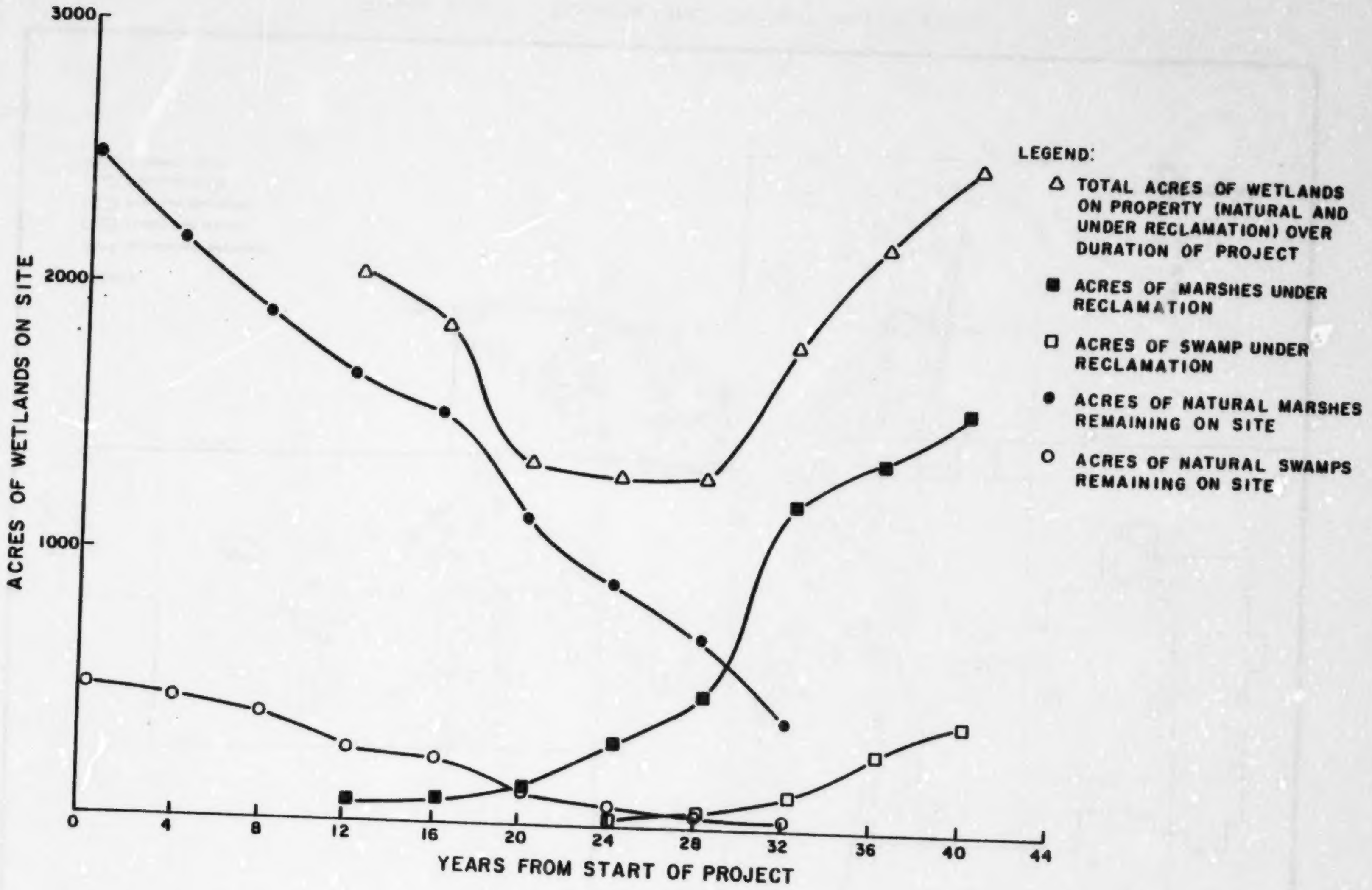


Figure 2.10-8. Wetlands Losses and Replacement Over the MCC Project Life.

2.11 PRODUCT TRANSPORT

2.11.1 System Description

Phosphate rock must be shipped from the mine at Ona to a local or port destination as efficiently and safely as possible with minimum potential for disruption. It is assumed that little of the rock would be sold locally. The alternatives selected for assessment are: (1) railroad to Tampa (truck as emergency option), barge to Pascagoula or other customer (proposed by MCC); (2) truck to Tampa, barge to Pascagoula; (3) slurry pipeline to Tampa, barge to Pascagoula; and (4) railroad to Pascagoula. The possibility of transporting rock by conveyer to Tampa was discarded as impractical because of the enormous capital costs, right-of-way difficulties, maintenance problems, and long-term disruption of other land uses.

2.11.2 Environmental Considerations

Railroads are well-established in central Florida and are generally considered the most economical and environmentally acceptable method of transporting bulk cargo between two fixed locations over land. Trains can disrupt traffic at highway intersections and generate noise adjacent to the right-of-way, however.

Trucks are a very flexible means of cargo transport. However, traffic disruption, safety, energy use, and air pollution are significant drawbacks. Also, it is not known if the present road sytems have the capacity to handle the additional truck traffic which would be generated by the project (approximately 430 trucks daily).

Pipelines are an energy efficient, reliable, and virtually impact-free (after construction is complete) method of transportation. However, the costs of construction and the great difficulty of obtaining rights-of-way are significant drawbacks to pipeline usage.

A comparison of energy use for the alternative methods of product transport is shown in Table 2.11-1. Disregarding the costs of pipeline construction, the most energy-efficient method of transport is by pipeline to Tampa, then barge to Pascagoula. An additional 0.0028 bbl of oil per ton of rock is required to transport by rail to Tampa (this is 2800 bbl of oil per 1 million tons of rock). The other two alternatives require substantially more energy.

2.11.3 Summary

From an environmental standpoint, the proposed plan of rail transport to Tampa and barge to Pascagoula is preferable. There would be virtually no construction activity; traffic would be confined to unit trains along existing, dedicated transport routes; energy use would be very nearly the lowest of all alternatives. In addition, costs would be substantially lower than for the other alternatives.

TABLE 2.11-1

ENERGY USE FOR PRODUCT TRANSPORT ALTERNATIVES

	Transport System			
	Rail to Tampa Barge to Pascagoula (Proposed by MCC)	Truck to Tampa Barge to Pascagoula	Slurry Pipeline to Tampa Barge to Pascagoula	Rail to Pascagoula
Distance Transported (miles)	Rail: 60 Barge: 440	Truck: 60 Barge: 440	Pipeline: 50 Barge: 440	Rail: 705
Energy Usage Rate (Btu/ton-mile)	Rail: 700 Barge: 600	Truck: 2500 Barge: 600	Pipeline: 500 Barge: 600	Rail: 700
Energy Use (Bbl No. 6 fuel oil equivalent per ton rock)	Rail: 0.0068 Barge: 0.0425	Truck: 0.0243 Barge: 0.0425	Pipeline: 0.0040 Barge: 0.0425	Rail: 0.0800
	Total: 0.0493	Total: 0.0668	Total 0.0465	Total 0.0800
Energy Use[a] (Bbl No. 6 fuel oil equivalent)	49,300	66,800	46,500	80,000

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[a] Calculated for 1 million tons per year of dry rock processed at Pascagoula.

2.12 NO ACTION

2.12.1 Background

The no action alternative would be denial of an NPDES permit. MCC cannot design a zero discharge system in central Florida because of the exceptionally heavy rains which frequently occur. Therefore, this option would effectively prevent phosphate mining on the proposed MCC site. No action would allow the area to continue along its present-day environmental and socioeconomic trends. These trends are summarized below with reference to the potential influence of the proposed mining project. No intensive development of the MCC site is expected to occur in the foreseeable future; primarily, land use is expected to remain principally that of unimproved pasture.

2.12.2 Effects of No Action

2.12.2.1 Water Resources

Surface Water

Under the proposed action, the drainage areas of both Brushy and Oak Creeks would be reduced in size as a result of mining and waste disposal activities (Section 3.2.1.2). In addition, under certain stream flow conditions, water would be diverted to a holding pond (Brushy Creek Reservoir) from Brushy Creek for make-up water usage. These activities would decrease the average flow in the two principal streams on the site, Oak and Brushy Creeks. Without the project, the stream flow would remain as it is now.

Some water quality changes may also occur in Oak Creek as a result of periodic discharges from the clear water holding pond. If the proposed project is not undertaken, water quality would not be changed.

Ground Water

For the proposed mining plan, ground water would be withdrawn from the lower Floridan aquifer to provide process make-up water. In addition, it would be necesary to dewater the mine pits so that the phosphate matrix could be extracted effectively. The former activity would result in a lowering of the water table in the lower Floridan aquifer; the latter activity would cause temporary lowering of the surficial aquifer water level, possibly interfering with water usage by offsite users. If the proposed mine plan was not implemented, the ground water levels would remain as they are, and nearby surface aquifer water users would not experience any temporary inconvenience which might result from dewatering operations on the site.

Approximately 14,084,640 gpd of make-up water (consumptive use) required for project operations would be entrapped in wastes and in the product. Although this volume of water would not be returned to the hydrogeologic system, its loss would not result in any long-term negative impacts on the site's water supply (Section 3.2.2.2).

2.12.2.2 Biology

Approximately 72 percent of the MCC site would be mined or used for waste disposal and then reclaimed under the proposed mining plan. As a result, much of the site's wildlife habitat would be disturbed (though not concurrently) until after reclamation.

If the MCC site were not mined, the terrestrial, aquatic, and wetlands habitats on the site would continue to change gradually as a result of natural conditions and existing agricultural ativities, but they would not experience the disruptive effects of mining operations. However, the proposed reclamation plan would restore many of the disturbed habitats to a more productive state than presently exists; this benefit would not be realized unless mining and reclamation occurred. For example, the Brushy Creek wetlands in the southern and central part of the property would remain largely isolated from, and would not be reclaimed to join with, the stream; presently channelized portions of Oak and Brushy Creeks would not be reclaimed to a more natural configuration and, likely, a more productive state; and improved pasture productivity and citrus production capacity would not be realized.

2.12.2.3 Air Resources

Air quality impacts resulting from the proposed action include sulfur dioxide and particulate emissions from the rock dryer and associated equipment as well as some particulate emissions from the mine site itself. However, the proposed activities would not cause exceedance of any state or federal air quality standards. Without the project, air quality in the site area would not change.

2.12.2.4 Socioeconomics

The regional and local baseline data and projections (see TSD-IV and Section 3.5) indicate that, if the "no-action" alternative were selected, neither significant positive nor negative effects would be experienced in the study area with respect to expected changes in population, economic growth, or in demands for community services and facilities. In the absence of new mine development, demographic and employment trends of the region and local area are expected to continue at their present and projected future rate.

The general result of the "no-action" alternative on socioeconomic conditions in Hardee County and the seven-county region would be unrealized, potential economic benefits. Property taxes which would be paid to Hardee County by MCC each year are anticipated to range from $750,000 to $1,200,000. This is from three to five times the amount the land would generate as agricultural land. The severance tax on phosphate ore removed from the property is estimated at $1,500,000 (half of this is refundable to MCC for approved reclamation activities). Annual expenditures by MCC for products and services would not be realized if the permit were not granted. State sales tax revenue on these expenditures is estimated to be between $747,000 and $914,000 per year (MCC, 1977).

The most significant result of the "no-action" alternative would be the loss of 94.5 million tons of phosphate rock reserves, a valuable, non-renewable resource. This loss of phosphate rock would constitute denial of the socioeconomic benefits of phosphate to United

States farmers, to agricultural support industries, and to the potential consumers of fertilizer-subsidized products. No action would also result in a loss of considerable project investment by MCC, and thus by the Corporation's 21,000 farmer-owners.

2.12.2.5 Land Use

At the present time, land in Hardee County and on the site is used primarily for agricultural purposes. The general trend toward agricultural usage would probably continue if a no-action alternative were followed.

2.12.2.6 Historical and Archeological Resources

If the MCC site were not mined, the limited historic and archeologic resources would remain intact. However, if the "no-action" alternative were implemented, Aboriginal Site 1, the only site on the MCC property considered to have potential cultural value (Section 3.5.3 and TSD-IV), would not be surveyed.

2.12.2.7 Radiology

As discussed in Section 3.6 and TSD-V, the reclaimed clay disposal areas with partial caps could marginally exceed the USEPA-recommended average external gamma radiation level. This indicates that buildings constructed on these areas after reclamation could exceed federally recommended indoor working levels for radon daughters. Recommended radiation levels are not expected to be exceeded on tailings disposal areas or on clay disposal areas with sand/clay caps.

If the MCC project were not undertaken, radiation levels on the site would remain the same as they are at present, and indoor working levels would not be above the recommended limits. However, local construction site preparation could mitigate the radiation levels of reclaimed clay storage areas so that there should be no restriction to construction on reclaimed land due to the proposed action.

2.12.3 Summary

Implementation of the no action alternative would prevent MCC from mining phosphate reserves on their Hardee County property. This would eliminate the following short term adverse impacts: reduction of surface water quality and flow in streams on the site; withdrawal of approximately 12.3 mgd from the Floridan aquifer; habitat disruption on approximately 8,200 acres of uplands and 2,540 acres of wetlands; localized increases in particulates and SO_2; an increase in radioactivity of surface soils above waste clay disposal areas; and destruction of archeological sites. Such a decision would also eliminate the following beneficial impacts: recovery of 94 million tons of phosphate reserves for use as a fertilizer; job opportunities and tax revenues associated with the project; and expected improvement in wetlands quality on the site after reclamation.

2.13 POSTPONEMENT OF ACTION

Phosphate is needed for fertilizer production. As the rich phosphate ore reserves are depleted by mining activities, it will be necessary to exploit the known reserves of lower quality ore in areas such as Hardee County. A delay in implementing MCC's proposed mining plan would postpone the availability of the MCC site phosphate reserves for fertilizer manufacture.

In addition, postponement of the action would have several economic impacts. It would delay mine-associated benefits to the county which would result from increased job opportunities, payroll, and taxes. The benefit of sales and severance taxes which would accrue to the state as a result of mining activities on the MCC site would also be postponed. Postponement would mean a loss to MCC of approximately $7 million annually for interest on the land holdings and $24 million annually due to inflation on the mine facility; these amounts would be compounded with time. Postponement would also impact MCC's 21,000 farmer-owners since the money that they have invested is not productive until the phosphate is sold.

Although the postponement of mining on the MCC site could slow development of the technology necessary to mine these low quality reserves, a period of mining deferral could also permit technological advances in waste disposal and reclamation. Such advances might mean, for example, better water recovery from waste clays and more efficient and productive reclamation of mined lands than would be possible with current technology.

2.14 USEPA'S PREFERRED ALTERNATIVE AND RECOMMENDED ACTION

Based on the environmental, technical, and economic analyses presented in the DEIS and supporting documents, the USEPA's preferred alternative for the proposed MCC project is outlined below.

Mining: Dragline
Matrix Transport: Slurry pipeline
Matrix Processing: Conventional beneficiation
Rock Drying: Dryer at Ona site
Process Water Source: Ground/Surface water
Wastewater Treatment: Discharge to surface waters
Waste Disposal: Sand/Clay cap
Reclamation: Conventional with sand/clay cap, restoration of onsite streams and Category II wetlands disrupted by mining activities.
Wetlands Preservation: Site-specific application of Areawide EIS wetland criteria.

From a purely environmental perspective, matrix transport by a conveyor system and the sand/clay mix waste disposal alternative are preferable to slurry pipeline transport and sand/clay cap waste disposal. The conveyor transport system at present is clearly technically infeasible for use in the central Florida phosphate district. Matrix transport by slurry pipeline is proven technology and environmentally acceptable.

The sand/clay mix alternative has been identified as a means to reduce the volume of storage area required to dispose of the waste clays associated with the phosphate beneficiation process. This would reduce the number and volume of above-grade clay storage areas and would clearly be desirable. Because of the low ratio (less than 2.0 to 1) of sand to clay on the property, full implementation of this alternative is not technically feasible. The MCC ore matrix is characterized by a higher percentage of clay than acceptable for use of this technology. The sand/clay cap alternative proposed by MCC optimizes use of the onsite geological resources and is environmentally aceptable.

The wetlands preservation alternative preferred by the USEPA is the site-specific application of the Areawide EIS wetland criteria. The site-specific alternative identified only the three onsite wetlands, totalling 233 acres (Figure 2.10-5), as being characteristic of Category I wetlands and worthy of preservation. The wetlands systems alternative (Section 2.10.4) identified two additional wetland areas (Areas A and C; Figure 2.10-6) as being of importance on the site. Because of the extensive stream channelization existing on the property, the small and isolated natures of most wetlands, and the generally lesser habitat and water quality value of these wetlands, they were not identified as characteristic of Category I wetlands. In view of the loss of these wetlands, a 90-acre restoration program would be conducted as an integral part of the USEPA's preferred alternative. This 90-acre program would be in addition to the restoration program identified in the Hardee County Development Order alternative (Section 2.10.1). The extensively alterred hydrologic character of the MCC property provides suitable sites for conducting a study of this nature. Functionally more valuable wetlands would likely be created during reclamation of the property for the wetlands which are not preserved.

During the environmental review process, several measures were identified which would mitigate or eliminate adverse impacts of the proposed project. To ensure the fullest environmental benefits are achieved, the USEPA specifically recommends that:

- A program to minimize impacts to the eastern indigo snake (a threatened species) occurring onsite be implemented as suggested by the U.S. Fish and Wildlife Service.
- A program to excavate a National Register-eligible aboriginal site on the property be conducted in consultation with the State Historic Preservation Office and Advisory Council.

- Mining in the vicinity of streams be conducted only along one side of the stream at a time.
- A setback (established as 250 feet) be defined around preserved wetlands to protect them from dewatering activities associated with mining.
- Preserve from mining activities the major functional wetlands onsite (Figure 2.10.5). Upon such time as MCC has demonstrated the creation of equally functional wetlands, MCC may re-open the case for mining the preserved areas.
- An experimental 90 acre wetland restoration program be conducted to demonstrate the ability of creating wetlands in historically wet areas. The program would be conducted in areas of Section 31, T34S-R24E and Section 32, T34S-R24E.
- Implement a sand/clay capping technique to minimize above-grade clay storage areas and restore topography to as close to original conditions as possible.

The USEPA tentatively proposes to issue an NPDES permit to MCC for the Hardee County Phosphate Mine. A draft of the proposed permit is appended to the DEIS (Appendix A). The project authorized by the permit is that described as the USEPA's preferred alternative in this document. This project would incorporate all measures identified as conditions of the permit (Part III, Conditions).

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3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 GEOLOGY/SOILS

3.1.1 Existing Conditions

The Mississippi Chemical Corporation (MCC) property comprises some 14,850 acres in west-central Hardee County in the central Florida phosphate district. The existing land surface of the MCC property is quite flat with a gentle, regional slope from north to south. Maximum elevation on the site is about 110 feet above mean sea level (MSL) to the northeast and falls to about 75 feet MSL adjacent to stream basins along the southern boundary (Figure 3.1-1). Maximum relief from north to south on the property is about 35 feet. Stream basins are generally broad, shallow and interspersed with broad, flat marsh areas. A number of roughly circular, shallow depressions are scattered homogeneously over the surface of the property. These depressions are up to 0.15 mile across and 5 feet or less in depth.

The Wicomico-Penholoway escarpment, which is one of several terraces indicative of sea level stands during the Pleistocene, trends east-west across the property, roughly bisecting it (Figure 3.1-2). This escarpment coincides roughly with the boundary between the fairly well-drained Polk Uplands to the north and the more poorly drained DeSoto Plains to the south.

3.1.1.1 Stratigraphy

The MCC property is underlain by a thick sequence of Paleozoic, Mesozoic, and Cenozoic sediments deposited on a Precambrian basement complex of igneous and metamorphic rock. The Tertiary and Quaternary Systems of the Cenozoic Era (Figure 3.1-3) contain rocks most important to the resources of this area. It is within formations of these ages that the principal ground water resources and phosphate ore beds occur. The important Cenozoic units are described briefly in the following paragraphs. More information on these systems and on the older, underlying rocks is provided in the Application for Development Approval for a Development of Regional Impact (ADA/DRI) (MCC, 1977) and in several

Florida geological survey publications (for example, Applin and Applin, 1944; Applin, 1951; Cooke, 1945; Parker and Cooke, 1944; and Puri and Vernon, 1964).

Holocene deposits in the area consist of sand, muck, or related swamp deposits and usually overlie the Pleistocene deposits which consist of loose quartz sands with various amounts of leached phosphate gravel and pale greenish-yellow clay. In the site vicinity, these deposits range from 5 to 40 feet thick, with an average thickness of 20 feet. The Pleistocene series lies unconformably over the Bone Valley Formation and, along with the Holocene deposits, comprises the material termed "overburden."

The Pliocene Series sediments are represented by the Bone Valley Formation which consists of interbedded sand, clay, clayey sand, and gravel with phosphate and limestone nodules. The Bone Valley Formation is included within the upper part of the ore matrix.

In the site vicinity, the contact between the Bone Valley Formation and the Hawthorn Formation is difficult to define. In this report, the clastic, phosphate-bearing sediments, including the Bone Valley Formation and the upper clastic deposits of the Hawthorn Formation, are designated potential matrix (Figure 3.1-3). These deposits average 40 feet thick in the site vicinity. The Hawthorn Formation, as depicted in the figure, includes only the lower carbonate sequence; this unit averages 200 feet in thickness.

The Miocene Series consists of the Hawthorn Formation and the underlying Tampa Limestone. The Hawthorn Formation has a variable lithology and typically consists of clay, marl, and sand overlying sandy to clayey limestone, and dolomite. The clastic upper Hawthorn is commonly highly phosphatic and, if of suitable phosphate content and mineability, is included within the lower part of the ore matrix. The upper limestone stringers of the Hawthorn Formation commonly comprise "bedrock" in the area. The Tampa Limestone consists of an upper dolomitic limestone unit and a lower unit of clay with interbedded limestone and quartz sand. In the site vicinity, the Tampa Limestone is about 150 feet thick.

The Oligocene Series is represented by the Suwannee Limestone. It is a granular, fossiliferous limestone with beds of crystalline, partly silicified, dolomitic limestone. The Suwannee is approximately 240 feet thick.

The Eocene Series is represented by four geologic units, the Ocala Group and the Avon Park, Lake City, and Oldsmar Limestones. These units are, for the most part, granular, porous, dolomitic, and fossiliferous limestones of variable hardness. The Eocene Series is approximately 2,500 feet thick in the vicinity of the site.

The Paleocene Series is represented by the Cedar Keys Limestone. It is about 2,000 feet thick and consists of granular, fossiliferous to dolomitic limestone.

3.1.1.2 Structure

Regional structural features that have influenced the geology at the MCC property are the South Florida basin, the Kissimmee Faulted flexure and the Ocala uplift. The South Florida basin is a downwarp structure that plunges westward toward the Gulf of Mexico, with its axis trending east-west. Sediments within the basin are Mesozoic and Cenozoic in age and have a gentle dip to the southwest. The basin subsided slowly from Jurassic to Middle Eocene. During this time, the environment of the basin was essentially that of a shallow to deep shelf supporting carbonate and evaporitic cyclic deposition. The Kissimmee Faulted flexure is a local, fault-bounded, tilted, and rotated block of Eocene or Oligocene age extending down the Florida peninsula in Orange, Osceola, and Lake Counties.

The regional structural feature that has the most significant effect on the property is the Ocala uplift, a gentle, local anticlinal structure. The Ocala uplift centers around outcrops of the Ocala Group (Upper Eocene) and Avon Park Limestone (Late Middle Eocene) in Citrus, Dixie, and Levy Counties on the west coast of the peninsula. Where exposed, the uplift is about 230 miles long and 20 miles wide. Fracturing and faulting of the Tertiary rocks is associated with the development of the uplift (Vernon, 1951).

Lineaments in the vicinity of the MCC property were studied to search for possible evidence of subsidence (P.E. LaMoreaux and Associates, 1976). Lineaments were delinated on Landstat imagery, air photo mosaics and conventional medium-altitude photography. Lineaments derived from the three types of imagery show strong modes in the N 40°-50° W, N 20°-30° W, N 30°-50° E, and N 60°-80° E orientation. Regional lineaments in northern Florida show modes in a N 48° W and N 48° E orientation (Vernon, 1951). Vernon (1951) attributes these lineaments to fracturing. A moderately good correlation of lineaments to bedrock lows is found in the MCC property area; however, very little correlation with topographic features is evidenced.

3.1.1.3 Sinkhole Development

The MCC property is located in an area of Florida where sinkholes are unlikely to occur due to the thickness of clastic sediment overlying limestone and a high potentiometric surface (Vernon and others, 1972). Additional studies at the MCC property (P.E. LaMoreaux and Associates, 1976) provide the following evidence that active sinkholes are unlikely to occur: (1) air photos, taken in 1942 and 1972, were compared for pond formation and found to be essentially unchanged; (2) no relationship between surficial depressions and remotely sensed lineaments was discovered; (3) ground studies of terraine features showed no indication of sinkholes features; and (4) examination of infrared aerial photographs showed no indication of active or incipient sinkhole activity. Evidence indicates that the shallow surface depressions found on the property are the result of solution and slumping of thin beds of calcareous materials or limestone lenses within the overburden and phosphate ore matrix. These depressions are not the result of large scale karstic development in the bedrock limestones.

3.1.1.4 Mineral Resources

The MCC property is underlain by almost 100 million tons of economically recoverable phosphate rock in areas deemed mineable with present technology. The matrix or phosphate ore occurs in the Bone Valley and upper Hawthorn deposits. In comparison with typical deposits in Polk and Hillsborough Counties, the matrix at the MCC site has an unusual thickness, low overburden ratio, small amount of pebble product, and a lower phosphate rock to sand/clay ratio.

Overburden, composed of loose sand and clay stringers, averages about 20 feet thick. Average matrix thickness is about 40 feet; matrix is composed of approximately 18 percent phosphate rock, 27 percent clay, and 54 percent sand. The MCC site is underlain by approximately 9,000 acres of presently economically recoverable phosphate ore.

3.1.1.5 Soils

Soils data presented in this report are based on the Interim Soil Survey Report for Hardee County published by the USDA Soil Conservation Service (SCS) in 1979. The Interim Survey provides a detailed, redefinition of soil series present at the MCC site. It should be noted that, while the overall characterization of site soils and lithologies as presented in the ADA/DRI (MCC, 1977) and on Figure 3.1-4 has not substantially changed, mapping unit names and locations have been modified. An updated soils map of the area incorporating the soil series presented in Table 3.1-1 is currently in preparation by the SCS.

Based on the revised soils classification system, 29 soils series have been recognized and mapped by the SCS on the MCC property. Table 3.1-1 presents pertinent data on these soils (USDA, 1979). Lithologically, the site soils are predominantly fine acid sands with low natural fertility. There are five muck to mucky series found on site that have somewhat higher natural fertility, but they generally underlie swampland and are not amenable to agricultural development. Hydrologically, the soils are predominantly poorly drained, have high permeabilities (particularly in the top horizon), and moderate to high runoff potential. As seen in Table 3.1-1, the erosion potential at the site is quite low. This is due to low relief and extensive existing ground cover.

General agricultural capability (with a high level of management) is presented for the site soils in Table 3.1-1. An explanation of the capability classes is presented in Table 3.1-2 (USDA, 1979). Site soils fall into Classes 3 through 7 and have severe to very severe limitations for agricultural development. Currently, the predominant agricultural land use at the site is pasture and improved pasture.

Engineering characteristics of the site soils are determined primarily by soil drainage and flooding potential. Strength and settlement properties of the sandy soils are acceptable; however, the mucks and mucky soils present foundation restrictions for structures. In general, moderate to severe restrictions are indicated for sanitary facilities and building site development on site soils that are poorly drained in the natural state. These restrictions are derived from the soil wetness, ponding, seepage, and slow percolation.

3.1.2 Environmental Impacts

Impacts are described in this section for the proposed actions and for alternatives which may affect impacts on geology, soils structure, and topography.

3.1.2.1 MCC's Proposed Action

Site mining by dragline would involve long-term disturbance of approximately 9,000 acres of the site's upper geological formations. These units would be mined to depths of 50 to 100 feet. The phosphate would be extracted, and the remaining material would be returned to the site, in a restructured manner, for reclamation purposes. No unique geological features underlie this site, and no significant impacts would occur.

Modification of the existing site topography would occur as a result of both mining and reclamation activities (Figure 2.9-1). Initially, a broad plateau about 60 feet above-grade and covering 2,527 acres would be formed by four clay storage areas, designated as "M," east of the railroad (Figure 2.8-1). Settling in Areas MC-1, MC-3, and MC-6 is expected to bring these areas to a final elevation of about 40 to 45 feet above-grade. Area MC-4 would be returned to an at-grade level by transporting stored clay to storage areas south of SR64. To the west of the railroad, Areas MC-5 and MC-7 (1,447 acres) would initially be 60 feet above grade, but they are expected to settle to a final elevation of 25 feet above grade; Area MC-2 (520 acres) would be returned to an at-grade level in the same manner as Area MC-4.

All areas designated as "DA" (3,200 acres) would initially have elevations of about 40 feet. These areas are expected to settle to existing grade. Areas designated as "A," "B," "1," and "2" (2,346 acres) would all be at-grade.

Approximately 400 acres of lakes would be created by mining and would ultimately blend with the general reclamation scheme.

Modification of the MCC site topography would be long-term in nature but would not result in any significant impacts to land usage. Potential impacts on surface water and wetlands are discussed in Sections 3.2.1 and 3.3.2.

Soils at the MCC site would sustain impacts derived from mining, plant site location, matrix transport, and reclamation. Impacts to natural soils from mining and reclamation would be their removal or permanent covering in those areas where mining, waste clay storage, and tailings disposal takes place, as well as areas left as lakes. Approximately 10,720 acres of soil would be subjected to long-term impacts.

The plant site would impact 160 acres of soil during the life of the mining operation. These impacts would include minor removal of soil for some foundations and preemptive land use.

The matrix slurry pipeline would have minor short-term pre-emptive use impacts on site soils.

3.1.2.2 Alternatives

Alternatives described in Section 2.0 which may have substantially different impacts on geology, soils, or topographic features from the proposed action are considered in this section. Choice of alternative mining methods, plant site locations, matrix transport methods, water sources, effluent disposal methods, and rock drying systems would have no significant difference in impact from proposed methods.

Ore Processing

Dry separation or direct acidulation of phosphate ores would result in less water retention in the waste clays and, therefore, much smaller volumes of waste clay for disposal. Above-ground waste clay storage areas might be eliminated, or at least significantly reduced. However, the addition of gypsum waste from the direct acidulation method would result in an increase in total waste volume at the mine site. In addition, with the acidulation process, hydration water contained in the gypsum would be of equivalent volume as the water retained in the waste clays with the proposed wet beneficiation process.

Waste Disposal/Reclamation Methods

The conventional method of waste disposal (separation of clays and sand tailings) and land reclamation (land and lakes) would alter the existing topography and soils structures to a greater extent than the proposed action. Approximately 11,325 acres of land would be subject to long-term renewal and/or coverage of natural soils. Approximately 7,500 acres of elevated lands (to 60 feet above natural grade) and 3,000 acres of lakes would be created. Soils would vary from clay caps on the elevated lands to sand tailings on approximately 1,000 acres of the site.

Sand-clay mixing (in the approximate ratio of 2 to 1) could theoretically be utilized to increase the consolidation rate of waste clays. Such a method would reduce the area and/or height of above ground waste storage areas and improve the fertility of reclaimed lands. However, as stated in Sections 2.8 and 2.9, there is not a sufficient volume of sand on the MCC property to implement this alternative.

Preservation of Wetlands

Several alternatives were presented in Section 2.10 for preservation of existing wetlands on the MCC site. Implementation of either the USEPA areawide wetlands preservation alternatives or the wetlands system preservation plan would exclude more than 1,000 acres from mining or waste disposal. The other two preservation plans would exclude less than 500 acres. Soils and topography would be unchanged within these wetlands.

No Action or Postponement of Action

If an NPDES permit were not issued to MCC, lands would remain basically in their present state. Somewhat more use of these lands for cattle grazing would likely occur in the foreseeable future.

3.1.3 Mitigative Measures

The proposed action incorporates economically feasible measures to mitigate effects on soils and topography by incorporating sand-clay caps and maximum restoration to natural grade. The proposed plan would recreate soils which are approximately as suitable as existing soils for agricultural use.

An additional mitigative measure would involve mixing all of the sand tailings with the sand/clay caps to raise the sand-clay ratio and achieve improved agricultural potential. This would involve substantial double handling of the tailings and significant additional cost to MCC.

TABLE 3.1-1

SOIL CHARACTERISTICS OF THE MCC SITE

Page 1 of 3

Soil Series[a]	Permeability (in/hr)	pH	Erosion		Flooding[d]	Capability[e]	Drained Charact.[f]
			K[b]	T[c]			
2. Zolfo fine sand	>20	3.6-7.3	0.10	5	N	3w	P
5. Tavares fine sand, 0 to 5 percent slopes	>20	4.5-6.0	0.17	5	N	3s	MW
6. Candler fine sand, 0 to 5 percent slopes	6.0-20	4.5-6.0	0.10	5	N	4s	E
7. Basinger fine sand	>20	3.6-8.4	0.10	5	N	4w	P
8. Bradenton fine sand, frequently flooded	6.0-20	5.6-8.4	0.20	5	F	5w	P
9. Delray mucky fine sand, depressional	6.0-20	5.6-7.8	0.17	5	N	7w	P
10. Pomona fine sand	6.0-20	3.6-5.5	0.20	5	N	4w	P
11. Felda fine sand	6.0-20	5.1-8.4	0.17	4	C	5w	P
12. Felda fine sand, frequently flooded	6.0-20	4.5-8.4	0.17	4	C	5w	P
13. Floridana mucky fine sand, depressional	6.0-20	5.6-8.4	0.17	5	N	7w	P
15. Immokalee fine sand	6.0-20	4.6-6.0	0.15	5	N	4w	P
16. Myakka fine sand	6.0-20	3.6-6.5	0.20	5	N	4w	P

TABLE 3.1-1 (Continued)

Soil Series[a]	Permeability (in./hr.)	pH	Erosion		Flooding[d]	Capability[e]	Drained Charact.[f]
			K[b]	T[c]			
17. Smyrna fine sand	6.0-20	3.6-7.3	0.20	5	N	4w	P
18. Cassia fine sand	6.0-20	4.5-6.0	0.15	5	N	6s	P
19. Ona loamy fine sand	6.0-20	3.6-6.0	0.20	5	N	3w	P
20. Samsula muck	6.0-20	3.6-5.5	-	-	N	4w	P
21. Placid fine sand, depressional	6.0-20	3.6-6.5	0.17	5	N	7w	VP
22. Pomello fine sand	>20	4.5-6.0	0.17	5	N	6s	MW
23. Sparr fine sand 0 to 2 percent slopes	6.0-20	4.5-6.5	0.20	5	N	3s	P
24. Jonathan fine sand 0 to 2 percent slopes	6.0-20	3.6-6.0	0.17	5	N	6s	MW
27. Bradenton-Bluff-Felda association, frequently flooded	-	-	-	-	C	-	P-VP
31. Pompano fine sand, frequently flooded	>20	4.5-7.8	0.15	5	F	6w	-
32. Felda fine sand, depressional	6.0-20	5.1-8.4	0.17	5	N	7w	P
33. Manatee, mucky fine sand, depressional	2.0-6.0	5.6-8.4	0.20	5	N	7w	P
34. Wauchula fine sand	6.0-20	3.6-5.5	0.20	5	N	3w	P
35. Oldsmar fine sand	6.0-20	3.6-8.4	0.20	5	N	4w	P

TABLE 3.1-1 (Continued)

Page 3 of 3

Soil Series[a]	Permeability (in/hr)	pH	Erosion K[b]	Erosion T[c]	Flooding[d]	Capability[e]	Drained Charact.[f]
36. Tomoka muck	6.0-20	3.6-4.4	-	-	N	3w	P
37. Bassinger fine sand, depressional	>20	3.6-8.4	0.10	5	N	4w	P
39. Bradenton fine sand	6.0-20	5.6-8.4	0.20	5	N	3w	P

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[a] Soil series are numbered to correspond with SCS soil survey mapping units (USDA, 1979).

[b] Soil erodibility factor.

[c] Soil loss tolerance.

[d] N = Never
C = Common
F = Frequent

[e] Agricultural class definitions are provided in Table 3.1-2.

[f] VP = Very Poorly Drained
P = Poorly Drained
MW = Medium Well Drained
E = Excessively Drained

Source: USDA, 1979.

TABLE 3.1-2

AGRICULTURAL CAPABILITY CLASSES

Class 1 - soils have few limitations that restrict their use.

Class 2 - soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 - soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class 4 - soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class 5 - soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.

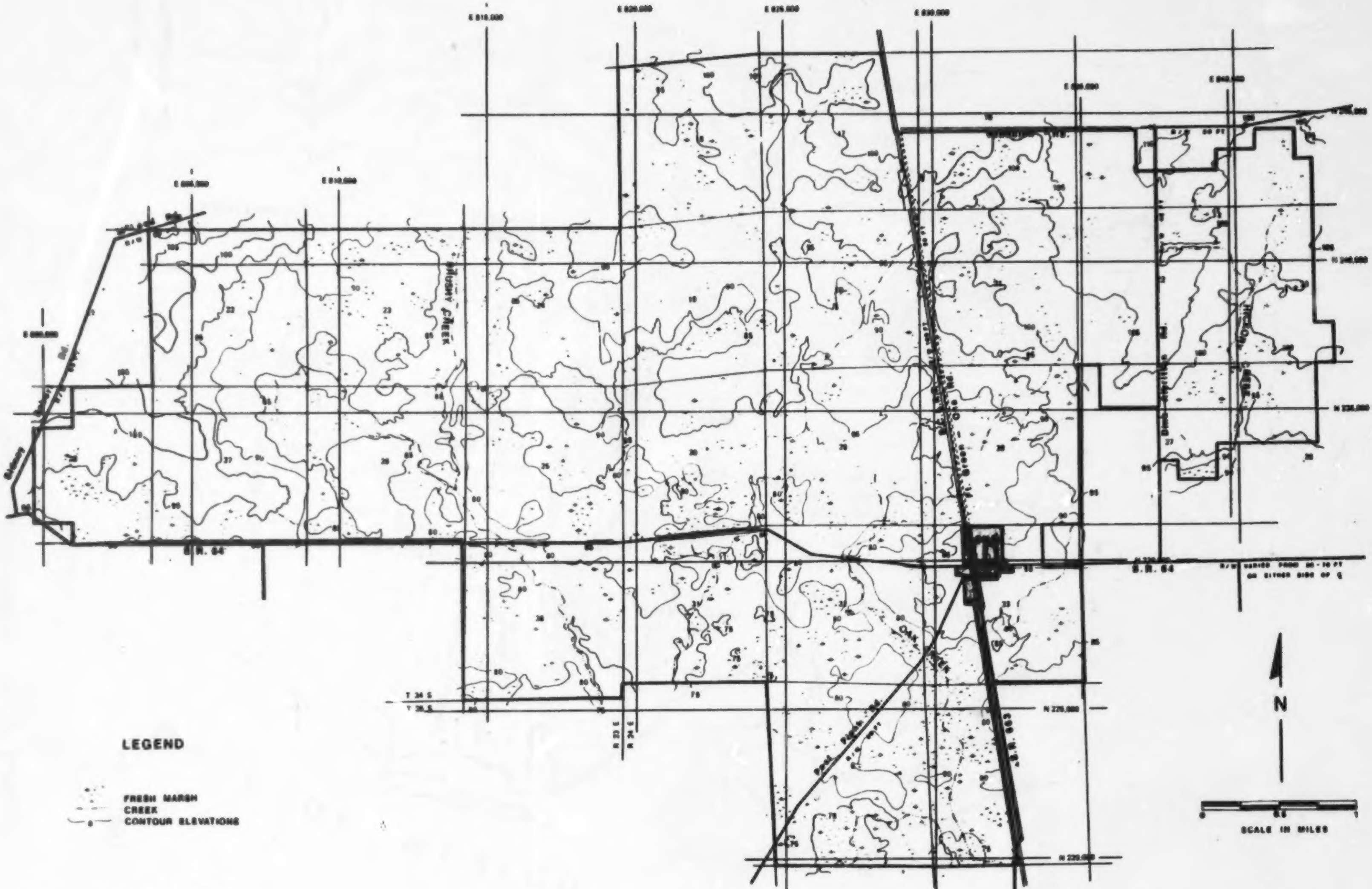
Class 6 - soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife.

Class 7 - soils have very severe limitations that make them unsuited to cultivation and restrict their use largely to pasture, range, woodland, or wildlife.

Class 8 - soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to aesthetic purposes.

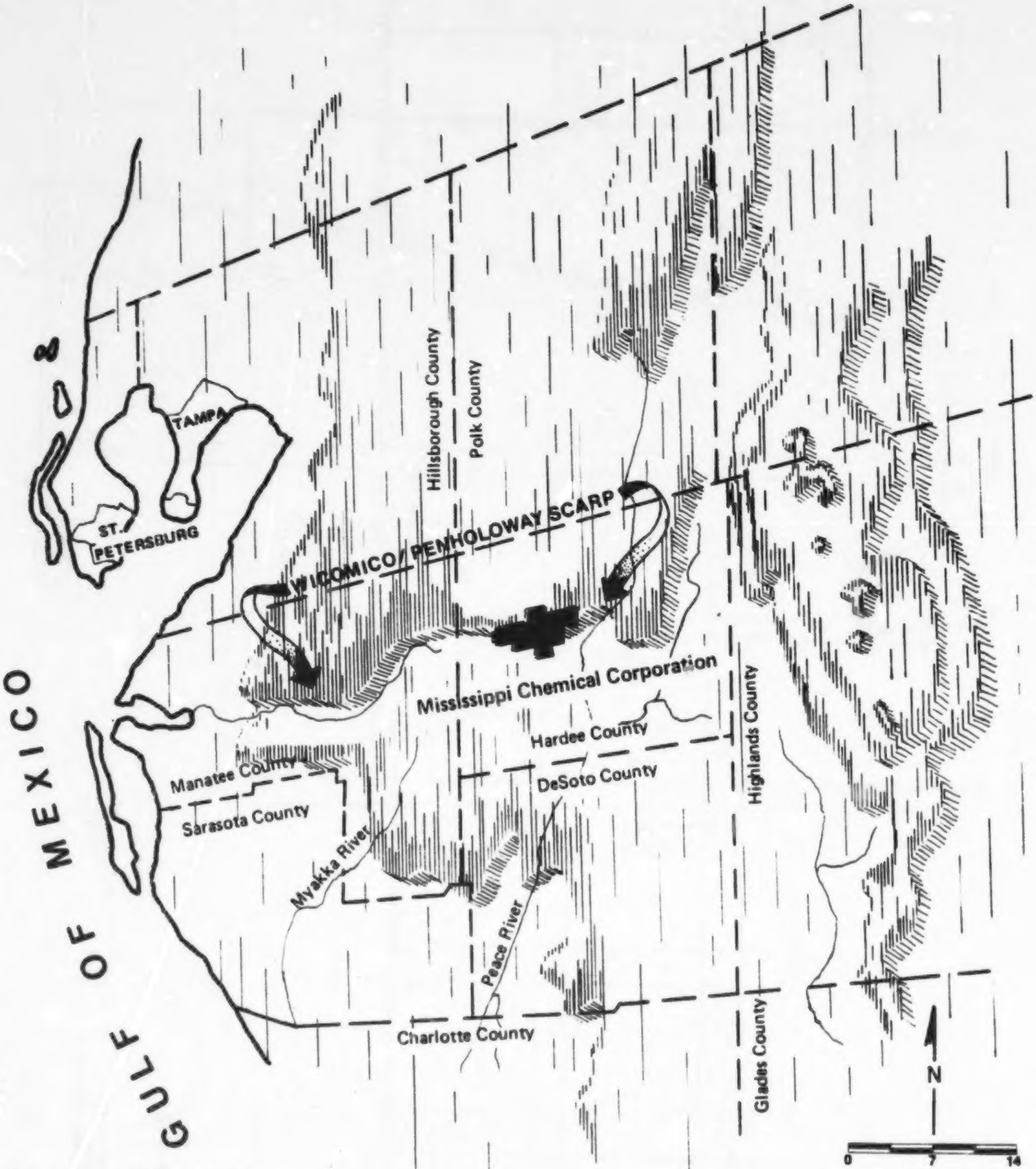
Capability subclasses are designated by adding a small letter, e, w, or s, to the class numeral, for example 2e. The letter e shows that the main limitation is risk of erosion unless close-growth plant cover is maintained; w shows that water in or on the soil surface interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainge); s shows that the soil is limited mainly because it is shallow, droughty, or stony.

Source: USDA, 1979.


E 805,000
E 810,000
E 815,000
E 820,000
E 825,000
E 830,000
E 835,000
E 840,000
N 245,000
N 240,000
N 235,000
N 230,000
N 225,000
N 220,000
BRUSHY CREEK
HICKORY CREEK
OAK CREEK
S.R. 64
R/W VARIES FROM 60-70 FT ON EITHER SIDE OF ℄
T 34 S
T 35 S
N
0
0.5
1
SCALE IN MILES
LEGEND
FRESH MARSH
CREEK
CONTOUR ELEVATIONS

Source: MCC, 1977.

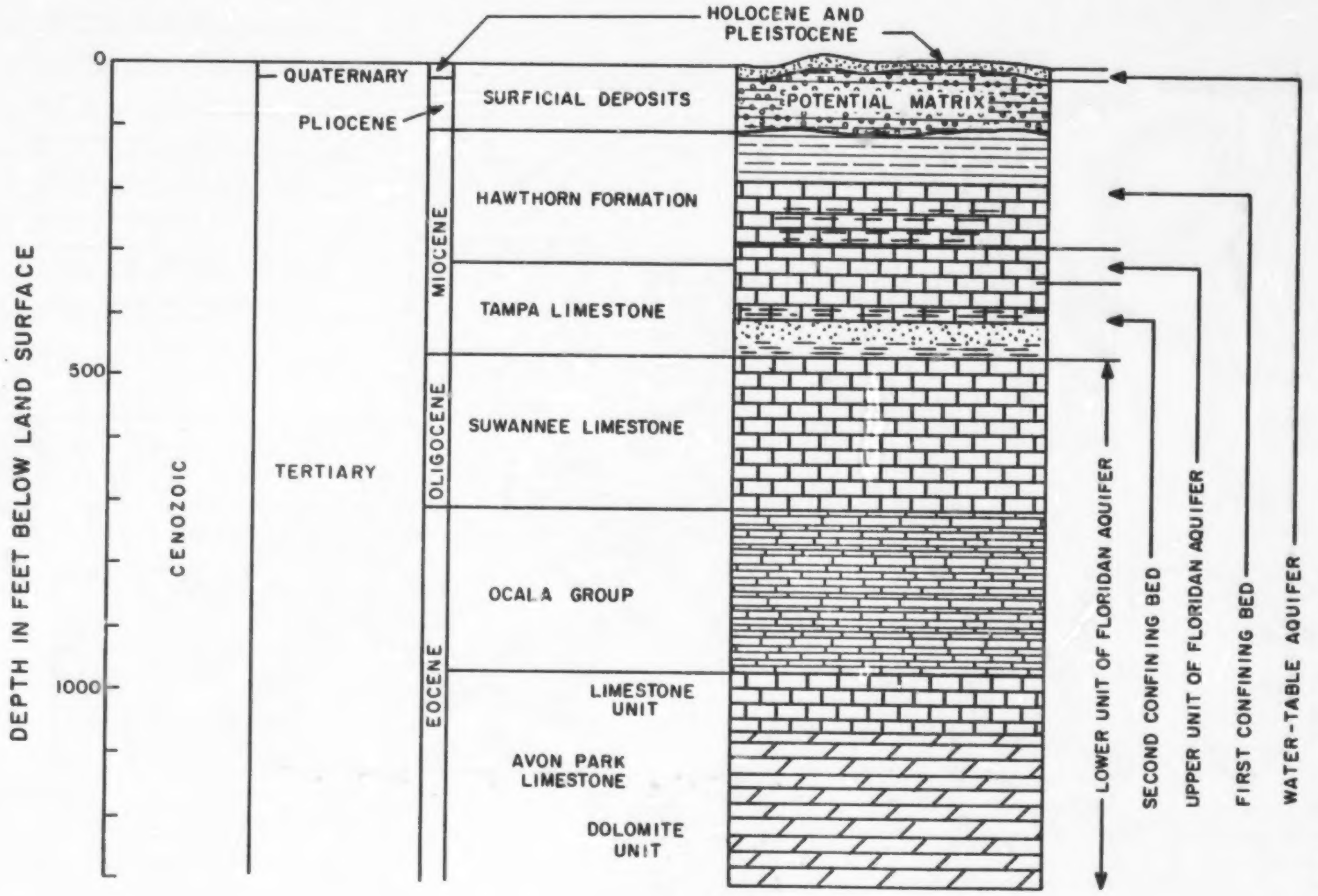
Figure 3.1-1. Existing MCC Site Topography.



GULF OF MEXICO
TAMPA
ST. PETERSBURG
Hillsborough County
Polk County
WICOMICO/PENHOLOWAY SCARP
Mississippi Chemical Corporation
Hardee County
Manatee County
Sarasota County
DeSoto County
Highlands County
Myakka River
Peace River
Charlotte County
Glades County
N
0
7
14
SCALE IN MILES

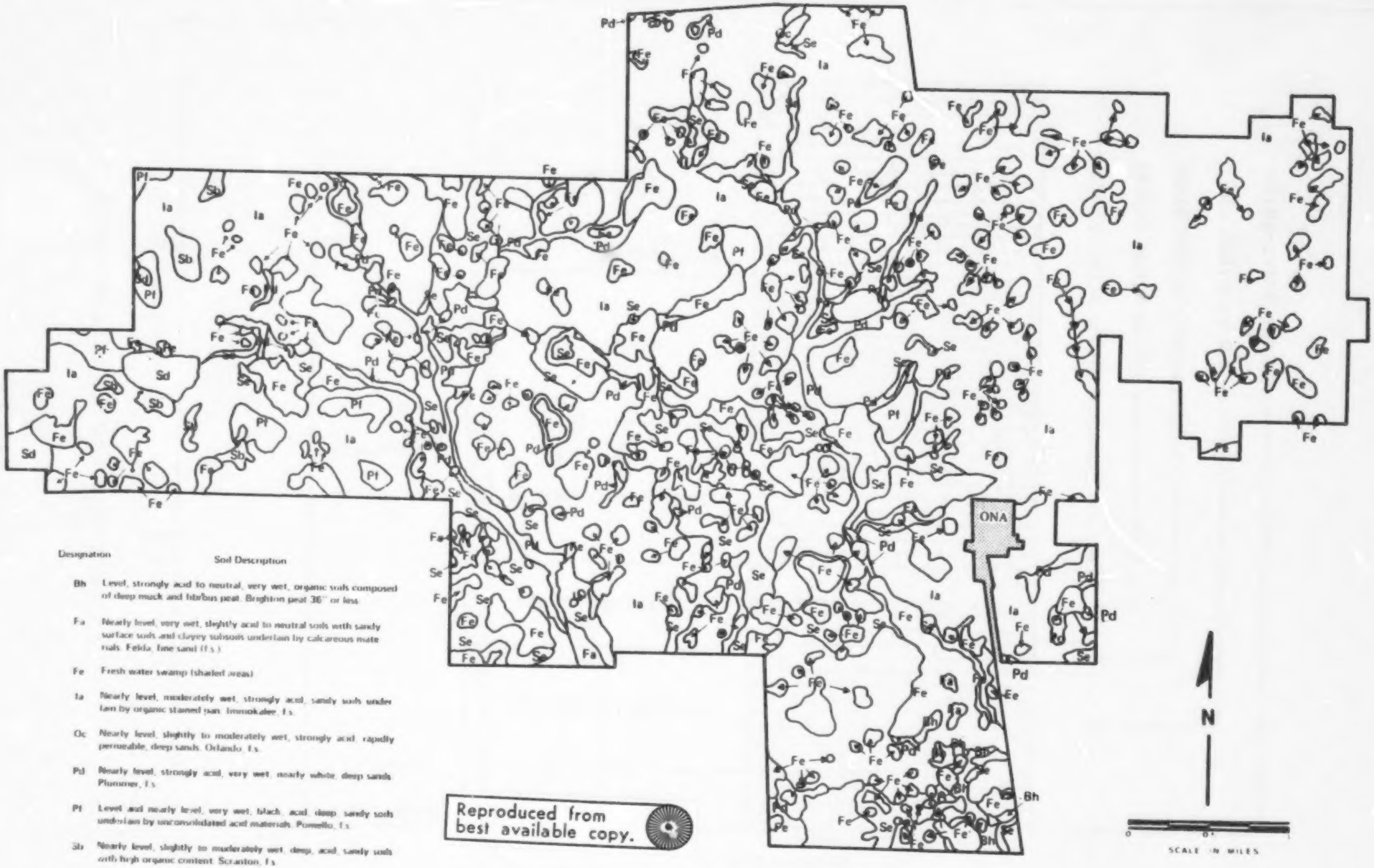
Source: MCC, 1977.

Figure 3.1-2. Wicomico/Penholoway Escarpment - Regional View.


DEPTH IN FEET BELOW LAND SURFACE
0
500
1000
CENOZOIC
QUATERNARY
PLIOCENE
TERTIARY
MIOCENE
OLIGOCENE
EOCENE
HOLOCENE AND PLEISTOCENE
SURFICIAL DEPOSITS
POTENTIAL MATRIX
HAWTHORN FORMATION
TAMPA LIMESTONE
SUWANNEE LIMESTONE
OCALA GROUP
LIMESTONE UNIT
AVON PARK LIMESTONE
DOLOMITE UNIT
LOWER UNIT OF FLORIDAN AQUIFER
SECOND CONFINING BED
UPPER UNIT OF FLORIDAN AQUIFER
FIRST CONFINING BED
WATER-TABLE AQUIFER

SOURCE: MCC, 1977.

Figure 3.1-3. Generalized Hydrogeologic Section.



Designation	Soil Description
Bh	Level, strongly acid to neutral, very wet, organic soils composed of deep muck and fibrous peat. Brighton peat 36" or less
Fa	Nearly level, very wet, slightly acid to neutral soils with sandy surface soils and clayey subsoils underlain by calcareous materials. Felda, fine sand (f.s.)
Fe	Fresh water swamp (shaded areas)
Ia	Nearly level, moderately wet, strongly acid, sandy soils underlain by organic stained pan. Immokalee, f.s.
Oc	Nearly level, slightly to moderately wet, strongly acid, rapidly permeable, deep sands. Orlando, f.s.
Pd	Nearly level, strongly acid, very wet, nearly white, deep sands. Plummer, f.s.
Pf	Level and nearly level, very wet, black, acid, deep, sandy soils underlain by unconsolidated acid materials. Pomello, f.s.
Sb	Nearly level, slightly to moderately wet, deep, acid, sandy soils with high organic content. Scranton, f.s.
Sd	Level to steep, nearly white, deep, draughty sands. St. Lucie, f.s.
Se	Nearly level, moderately wet, neutral sandy soils, moderately deep to calcareous clayey subsoils or marl. Sunniland, f.s.

Reproduced from best available copy.

Source: MCC, 1977.

Figure 3.1-4. Soils on the MCC Site.

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3.2 WATER RESOURCES

3.2.1 Surface Water

3.2.1.1 Existing Conditions

Hydrologic Description

The MCC site is located in the west-central portion of the Peace River Basin, as shown on Figure 3.2-1. The Peace River originates in central Polk County and flows generally south-southwest for a distance of 105 miles to its mouth at Charlotte Harbor and the Gulf of Mexico. The average slope of the river is approximately 1 foot per mile. The Peace River has a drainage area of approximately 2,400 square miles at its mouth, and an outflow equivalent to an average runoff of about 9 inches per year over the entire basin. However, surface runoff is less than this amount since the river receives discharge from the Floridan aquifer along most of its length (Environmental Science and Engineering, Inc., 1977).

Horse Creek, a major tributary to the Peace River in the site vicinity (Figure 3.2-2), drains an area of 245 square miles within the western portion of the Peace River Basin. The creek flows generally south for a distance of more than 25 miles at an average slope of approximately 5 feet per mile, and joins the Peace River just upstream of Charlotte Harbor (Environmental Science and Engineering, Inc., 1977).

In addition to Horse Creek, five small, intermittent streams receive drainage from the mine site. Brushy, Oak, and Hickory Creeks traverse the property, while Lettis, Troublesome, and Horse Creeks receive drainage from peripheral areas of the site. Lettis Creek is a tributary to Brushy Creek which, in turn, is a tributary to Horse Creek. Oak, Hickory, Horse, and Troublesome Creeks are all tributaries to the Peace River. A summary of MCC site acreage which drains into each of these streams is provided in Table 3.2-1. Brushy and Oak Creeks receive drainage from over 85 percent of the site and are therefore the primary streams which could potentially be impacted by mine development. The baseline characteristics of Brushy and Oak Creeks will be described in this section. The characteristics of the other streams which receive mine site drainage may be found in the ADA/DRI (MCC, 1977).

Streamflow

The nearest location for which long-term streamflow data representative of the flow characteristics in the project area are available is on Horse Creek near Arcadia. The USGS has maintained a stream gaging station at this location since April 1950. The station is approximately 20 miles south of the mine site and has a contributing drainage area of 218 square miles. An average flow of 198 cubic feet/second (cfs) has been recorded at the station over the 28-year published period of record. The highest streamflows at the Arcadia gaging station have been reported during the late summer and early autumn months from July through October when average flows have been more than 300 cfs. The lowest streamflows have occurred during the months of November through May, when average flows were generally less than 100 cfs.

Flow in the small streams which receive drainage from the mine site is highly variable. During rainy periods, flows in the streams increase significantly due to upstream runoff, but the flows later decrease to a level maintained predominantly by water derived from the water table aquifer. During prolonged dry periods, all of the smaller streams, except Horse Creek, become intermittent.

Average Flows - Average flows for streams in the project area were derived from a transfer of daily flows from the USGS gaging station on Horse Creek near Arcadia. The transfer of daily flows was made on a basis of unit discharge, or discharge per square mile. Due to the transfer of flows from a large basin to smaller basins, unit discharges were increased for high flows and decreased for low flows. The average flows for Brushy and Oak Creeks were determined to be 30 cfs and 11 cfs, respectively, at the points where these streams leave the mine site property.

Low Flows - Low flow characteristics of streams in the project area were estimated from the results of a low frequency and duration analysis of streamflow data for the USGS gaging station on Horse Creek near Arcadia. Several times during the spring of 1976, there was no flow in the site streams, although Horse Creek near Arcadia had a flow greater than its computed 10-year, 7-day low flow. Therefore, the 2-year, 7-day and the 10-year, 7-day low flows of all streams on the property are essentially zero (MCC, 1977).

Flood Flows - Flood flows for streams in the project area were derived from the results of a flood frequency analysis of streamflow data for the USGS gaging station on Horse Creek near Arcadia. Flood frequency discharges at the Horse Creek gaging station were transferred to streams in the project area by the following relationship:

$$Q_n = C_n A^{0.7} (S/S_t)^{0.2}$$

where:

Q_n = peak flood discharge (cfs) having a return period of n years,

C_n = discharge coefficient for flood having a return period of n years,

A = drainage basin area (square miles),

S = main channel slope (ft/mi), and

S_t = Drainage basin storage (percent).

The equation was first used to determine the discharge coefficients for the various return period floods, based upon the peak flood discharges from the flood frequency analysis and known values of area, slope, and storage for Horse Creek near Arcadia. The equation was then used to determine the peak flood discharge for streams in the project area, based upon their known physiographic characteristics and the

the discharge coefficients. The results of the analysis indicate 100-year flood discharges for Brushy and Oak Creeks to be 3,720 cfs and 2,290 cfs, respectively, at the points where these streams leave the MCC property. Discharges for other return floods are presented in the ADA/DRI (MCC, 1977).

Flood profiles were computed for streams which cross the mine site property using the USGS Step Backwater Program No. E431. Program input consisted of the flood discharges and surveyed stream cross sections. The resulting flood profiles were then transposed to a contour map to delineate the floodplain boundaries for the various return period floods. Boundaries of the 2-, 25-, and 100-year floods, for all streams which have a mean annual flow greater than 5 cfs are presented on Figure 3.2-3.

Water Quality

The water quality characteristics of the Peace River and Horse Creek Basins are summarized in Table 3.2-2. Data for the Peace River were compiled from two USGS water quality monitoring stations, located at Arcadia and Zolfo Springs (Figure 3.2-1). The Horse Creek water quality data were collected over a 7-year period by the Florida Department of Environmental Regulation (DER). Most of the parameters reported in Table 3.2-2 exhibit a relatively wide range of variability. The Peace River has a significantly higher specific conductance and fluoride concentration than does Horse Creek. Total phosphate and orthophosphate concentrations are also much higher on the Peace River, reflecting the effects of chemical plant effluent and past mining of phosphate pebble deposits. Horse Creek is more highly colored and has a higher alkalinity than does the Peace River. Horse Creek also has a slightly lower average dissolved oxygen concentration, but greater range of variability, than does the Peace River (Environmental Science and Engineering, Inc., 1977).

The water quality characteristics of the streams which receive site drainage were determined during a one-year monitoring program conducted monthly from December 1975 through November 1976. The results of the water quality monitoring program for Brushy and Oak Creeks, summarized in Table 3.2-3, indicate that these streams are more acidic and have lower dissolved oxygen concentrations than is characteristic of the Peace River and Horse Creek Basins (Table 3.2-2). The streams also have lower levels of specific conductance and alkalinity and much lower sulfate concentrations. Fluoride, phosphate, and orthophosphate concentrations in Brushy and Oak Creeks are similar to those in the Horse Creek Basin. The waters of the site streams are much more highly colored than is characteristic of the Peace River or Horse Creek Basins (Environmental Science and Engineering, Inc., 1977).

3.2.1.2 Environmental Impacts

MCC's Proposed Action

Reduction of Streamflow - During mining, certain parcels of land would be periodically removed from the natural drainage system. Flow would be reduced in streams tributary to such areas during these periods, since the areas would be isolated from the streams' drainage basins and would not contribute runoff to their flow. During the active mining phase, rain falling into the open pits would not contribute to streamflow. Similarly, areas used for clay storage and tailings disposal would not contribute to streamflow during their use.

Flow reductions were computed based upon the maximum and average accumulated areas occluded from streamflow during the period of mining. Only reductions of the long-term average flows of streams were evaluated because the actual flows and the actual reductions thereof would be dependent upon factors such as annual variations in rainfall and the actual size of the disturbed areas. Brushy Creek would have a 6 percent average (and 13 percent maximum) reduction of flow where it exits the MCC site. Similarly, Oak Creek would have a 13 percent average (and 29 percent maximum) reduction of flow where it exits the site property.

Diversion of Streamflow - In order to reduce the use of ground water, surface water would be diverted from Brushy Creek to provide part of the make-up water needed for mining operations (Section 2.5). Surface water would be diverted to an offstream storage basin, which would be in operation by the fourth year of mining, located to the east of Brushy Creek and north of State Road 64 (Figure 2.8-1). The basin would cover approximately 200 acres and have a storage capacity of approximately 9,500 acre-feet.

The diversion of streamflow into the storage basin would be controlled by a pair of weirs. A fixed main channel weir would be constructed across Brushy Creek, just downstream of the diversion channel for the storage basin. A fixed side channel weir would be constructed across the diversion channel, the lowest bay of which would be 0.25-foot higher than the lowest bay of the main channel weir. With such an arrangement, diversion would not occur when the flow in Brushy Creek is less than 3.25 cfs. When the streamflow exceeds this level, a portion of the Brushy Creek streamflow would be diverted into the storage basin.

A simulation analysis was performed to quantitatively determine the probable average amount of surface water which could be supplied by the storage basin during the project lifetime. Daily discharges for Brushy Creek were computed over a 25-year period, based upon flow data available at Horse Creek near Arcadia and the transfer relationship used to derive average flows (Section 3.2.1.1). The simulated flows were adjusted to reflect reductions of streamflow resulting from mining operations in the basin. The results of the analysis indicate that the storage basin would provide an average of 8.49 cfs over the 25-year period of simulation, representing a 28 percent reduction of the natural average flow of Brushy Creek at the point where it exits the mine site property (MCC, 1977). The SWFWMD Consumptive Use Permit (Appendix D) allows withdrawal of 5,086,000 gpd (7.87 cfs) from the Brushy Creek Basin on an annual average basis, though specific minimum flows must be allowed during each month of the year (SWFWMD, 1977).

Effluent Discharge - Discharges to Oak Creek could occur at certain times of the year as a result of overflow from the clear water pond. Rain falling onto active clay settling areas, open mine pits, the clear water pond, and plant site runoff would all contribute to the overflow. As shown on Figure 2.5-1, the annual average discharge from the clear water pond is estimated at 2.31 MGD (3.57 cfs). As discussed in Section 3.2.1.3, measures are to be taken to reduce or eliminate pond overflow. The most likely time for effluent discharge is during the wet season from June through September.

The expected chemical composition of the clear water pond overflow is presented in Table 3.2-4. In addition to these parameters, the effluent may contain extremely diluted amounts of amines, kerosenes, and other reagents used in the physical separation and concentration of phosphates.

All discharges to Oak Creek from the clear water pond would be subject to the effluent limitation standards of performance for new sources. The applicable USEPA effluent limitations as well as the standards imposed by the Florida DER are listed in Table 3.2-5. Comparison with the data presented in Table 3.2-4 indicates that the expected discharge would be within the effluent limitations for all parameters listed.

Computations were made for two conditions: (1) average effluent discharge conditions and (2) reasonable worst case conditions. For analysis purposes, it was assumed that all discharges occurred during the most likely, "wet" season, extending from June through September. Therefore, the average effluent quantity was considered to be three times the annual average, or 6.93 MGD (10.71 cfs). Ambient flow conditions in Oak Creek during this period were assumed to be the monthly average discharge, corrected for reduction due to mining activities, as given in MCC (1977): June - 7.9 cfs; July - 15.9 cfs; August - 20.4 cfs; September - 24.7 cfs, Maximum effluent flow rate was assumed to be 20 MGD, as specified by MCC in its NPDES permit application. Water quality parameters for the effluent discharge and for Oak Creek, prior to effluent mixing, are given in Tables 3.2-4 and 3.2-3, respectively. With the exception of temperature, pH, and specific conductance, average ambient and effluent concentrations were used to compute the fully-mixed concentrations in Oak Creek resulting from effluent discharge. The rationale followed in establishing these assumptions for the analyses of reasonable worst case conditions is as follows. For the effluent stream, the discharge rate of 20 MGD would occur only under conditions of heavy rainfall, so that dilution of chemical constituents would be expected. (Maximum effluent concentrations would be most likely under low discharge conditions.) MCC would make every effort to lower the pond level prior to predicted heavy rains so that the period of discharge at 20 MGD would not extend very long after rainfall ceases. Stream flow rates would also be elevated during this period, and it is expected that the 20 MGD effluent discharge rate would be reduced toward average conditions by the time the Oak Creek stream flow returns to normal.

The results of the analysis and a comparison of estimated fully mixed water quality conditions with Florida's General and Class III water quality standards are presented in Table 3.2-6. Results are given for both average and maximum effluent discharge rates for the months of June through September. As may be seen, the effluent discharge would have little effect on the temperature or pH of Oak Creek. Levels of pH below the minimum of 6.0 established by the standards could occur, but would be a result of the low ambient pH of Oak Creek rather than effluent quality. An increase in specific conductance greater than the allowable 100 percent above ambient could occur, especially if maximum effluent discharge levels were to coincide with minimum ambient levels. The maximum level of 500 μmhos/cm is also likely to be exceeded. Effluent discharge could also result in a concentration of oil and grease two to three times greater than the maximum allowable 5.0 mg/l. The expected average concentration changes in

Oak Creek for the other parameters present in the effluent are shown in Table 3.2-6. For parameters present in the effluent but for which no ambient water quality data exists, the mixed concentrations represent the maximum increase over ambient which could occur as a result of effluent discharge.

Local Water Quality Degradation - Sediment from parcels of land cleared of vegetation could result in local water quality degradation. Sediment includes solids and organic material detached from the ground surface by erosion and carried into the drainage system by runoff. The introduction of sediment into the streams which receive mine site drainage would result in an increase in turbidity and solids deposition. Sediment may also contain residues of other harmful pollutants such as petrochemicals which would further degrade water quality.

A potential source of local water quality degradation would be the accidental spillage of waste clays. Of particular concern would be the rupture of a clay slurry pipeline at a location near a stream, which could result in a large temporary increase in stream turbidity and have other adverse chemical and biological effects.

Hypothetical Clay Settling Area Embankment Failure - Waste clays generated by the phosphate beneficiation process would be hydraulically disposed of in clay settling areas, formed by earthen embankments with a height of 35 to 60 feet. Such areas would provide containment for the clay slurry and would return clarified decant water to the plant recirculating water system. During the project lifetime, approximately 7,700 acres would be required for clay settling areas (MCC, 1977).

An estimate of the probability of an embankment failure was made based on the average annual risk of a modern dam failure (approximately 0.01 percent), adjusted for hydrological and structural conditions unique to the project area. The most common causes of conventional dam failures are, in order of decreasing probability: overtopping during large floods; subsurface erosion and piping; earthslides; and earthquakes. These factors are less likely to cause failure with the clay settling area embankments than with a conventional dam for the following reasons: accurately predictable peak water levels; favorable soil and seismic conditions; uniform embankment and foundation sections; and rigorous design and inspection requirements imposed by the Florida DER. If the above factors cumulatively reduce the risk of embankment failure to approximately one-tenth of that for a modern dam, the average annual risk of a clay settling area embankment failure would be 0.001 percent, or one chance in 100,000 per year (USEPA, 1979).

In spite of the extremely low probability of occurrence, calculations have been made to estimate the area that would be affected by a rupture of a clay settling area embankment and the associated spill of contents onto the surrounding terrain. The settling area selected for consideration, designated MC-6 and having an area of 1,036 acres, is the largest such area proposed for the mine site.

For purposes of analysis, a 200-foot wide break was assumed to occur in the MC-6 dam at the point of intersection with the existing Hickory Creek channel. Although the dikes around Area MC-4 would serve as a barrier to the flow of material originating from a dam break at MC-6, this effect was not considered so that a worst-case scenario could be analyzed. Two cases were considered: 1) a "dilute case," in which the waste clays are in the most fluid state (assumed to be the consistency of water for the purposes of this analysis) and consequently would attain maximum spreading; and 2) a "thick case," in which the clays have low fluidity and would spread across a minimum area. The HEC-1 hydrologic computer program was used to evaluate the flow of dilute waste clay slurry and a single geometric solution was applied to define the area that would be covered by thick, viscous wastes. The results indicate that an area of between 4.5 ("thick case") and 6.0 ("dilute case") square miles in the Hickory Creek and Oak Creek basins would be affected (Figure 3.2-4). It is significant to note that the clay waste would be confined to the Hickory and Oak Creek basins and would not affect Troublesome Creek on the east. The affected area would cover large portions of Ona. For a "dilute case" dam break, some fluid would reach Ona within about 45 minutes of the initial dam breach; within about 1.5 hours of the initial breach, the fluid would reach its peak flood stage and would cover parts of Ona to an elevation of 92 feet MSL. This represents a depth of about 2 to 2.5 feet. The flood would subside, and the material would flow downstream from Ona within 2 to 3 hours of the initial dam break. For the "thick case," the peak stage at Ona would occur later and would reach a lower elevation.

The above-described dam failure analysis was selected to represent worst case impact potential: the largest and highest clay storage area was selected; a worst case dam break was assumed, with failure occurring at the base of the dam (for the "dilute case") and in close proximity to a water course. No account was made of either onsite storage resulting from filling of mine cuts or of internal diking within MC-6 which would limit the volume of clay released in an external dam failure.

Although it is not possible to quantify the effects that would occur in the Peace River and, eventually, in Charlotte Harbor as portions of the clay wastes were carried downstream after dam failure, qualitative impacts can be estimated from those reported for the December, 1971 Cities Service Company incident (Florida Game and Fresh Water Fish Commission, 1973).

In the Cities Service Company incident, an estimated 1 billion gallons of phosphatic clays were released into Whidden Creek and then to the Peace River. Turbidities in Whidden Creek reached a maximum of 26,000 Jackson Turbidity Units (JTU) on the day of the incident (with 7.0 JTU as the background turbidity); the turbidity in the Peace River reached a maximum of 12,000 JTU at Bowling Green (background = 7.5 JTU) the day after the incident and 16,000 JTU (background = 5.8 JTU) three days after the incident at Ft. Ogden. Within three days of the incident, turbidities dropped to 66 JTU in the Peace River at Bowling Green; six days after the spill, all affected waters downstream to Arcadia had returned to within 50 JTU above background turbidity levels. However, excessive turbidities were observed in the intertidal section of the river until the occurrence of Hurricane Agnes in June 1972 (Florida Game and Fresh Water Fish Commission, 1973).

A survey of SWFWMD permits indicates that there are no permitted surface water users (all drinking water withdrawals must be permitted by SWFWMD) for Hickory and Oak Creeks (Ames, 1981). Only one permit for public water supply withdrawal has been issued for the Peace River between its confluence with Hickory Creek and Charlotte Harbor. General Development Utilities, Inc., (GDU) withdraws water from the Peace River in Hardee County in T39S, R23E, Section 15 (Ames, 1981). GDU has a full-reservoir storage capacity to provide sufficient water for five to six months (Wirth, 1981). Therefore, GDU would normally have enough water in storage to allow a disruption of water withdrawals from the Peace River for several months, and a dam break on the MCC property would, therefore, have a minimal effect on GDU's drinking water supply during much of the year. However, during the dry season (October through April), GDU can withdraw only relatively small amounts of water from the Peace River so that its water storage volume becomes depleted. If a dam break occurred on the MCC property during the latter part of the dry season or early part of the wet season, GDU could experience some water supply difficulties due to a combination of low reservoir storage and poor water quality in the Peace River.

The effect of an MCC dam break on the aquatic biota would probably be similar to the effects described for the Cities Service incident (Florida Game and Fresh Water Fish Commission, 1973). Fish and benthic organisms in the areas receiving the heaviest slime loads would be lost. The direct effects, primarily from clays covering benthic organisms or coating the gills of fish, would last for many months. Many fish would migrate further downstream, resulting in increased competitive pressure on downstream communities. The loss of macrophytes in the immediate vicinity would be restricted to areas with the highest waste concentrations. However, increased turbidity would result in decreased phytoplankton productivity and would also interfere with respiration and feeding of filter feeders for many miles downstream.

In areas with highest slime blanketing, there would be disruption of wetland functions and displacement of wildlife. However, through several periods of normal rainfall, these areas should recover to near normal function and habitat value.

Alternatives

The alternatives which are described in Section 2.0 that may have significantly different impacts on the surface water hydrology than the proposed action are discussed in this section. Impacts to the surface water hydrology resulting from plant site location and product transport would be similar for each alternative.

Mining - The BWE mining method would have a similar impact on the surface water hydrology as the proposed action, but the dredge method would result in higher water consumption. Increased water usage would result from: 1) greater water entrainment in clays due to the wet operating conditions necessary for the dredge, and 2) evaporation from the dredge pond.

Matrix Transport - Matrix transport by conveyor belt or truck would require less water usage at the point of active mining than would slurry pipeline transport. However, it would be necessary to add water at the beneficiation plant to permit processing by the wet process.

Ore Processing - Less water would be entrained in the waste clays if the dry separation or direct acidulation methods of beneficiation were employed instead of the wet process method. However, some water of hydration would be contained in the waste gypsum generated by the direct acidulation method; this would create approximately equivalent retention of water in waste clays under this process. In addition, the extensive utilization of sulfuric acid in the direct acidulation method could result in an increased potential for water quality pollution.

Water Sources - Usage of surface water or ground water as the sole water source would result in significant impacts to other water users in the site area. There is not sufficient surface water to supply MCC needs. If maximum amounts of surface water were used, streamflow would not be sufficient to supply the needs of downstream users. If ground water were the sole source of project water needs, aquifer withdrawals would increase 41 percent, causing more noticeable drawdown effects on other users. During the first three years of the project, total water usage would come from ground water supplies.

Liquid Effluent Disposal - The alternative effluent discharge plan would produce water quality impacts on Hickory Creek rather than Oak Creek, where the proposed discharge location would be situated. Under the alternative plan, one of the discharge points would be located at the site boundary; discharge at this location would eliminate the benefits which would result from natural stream purification if the discharge point were farther from the property boundary, as it is under the proposed action.

Rock Drying - If rock drying operations were eliminated and wet rock were processed at MCC's Pascagoula chemical plant instead of at the mine site, as proposed, expansion of dock facilities would be necessary on Bayou Casotte. This could result in a temporary, localized impact on the water quality in the bayou.

Waste Disposal and Reclamation - If the conventional waste disposal plan were implemented, water usage would be increased due to the longer period of time which would be required for waste clays to compact and release water. In addition, the conventional method would require more above-grade clay storage, thus increasing the potential for dam breaks and release of clays into surface water systems.

Use of the sand/clay mixing method could (if pilot test results could be realized in a full-scale operation) allow faster clay settling, making larger volumes of water available for other uses; it would also decrease the amount of above-grade storage areas, reducing the potential for dam breaks. If the flocculation method were used to combine the sand and the clay, flocculants could be introduced into the local aquatic environment.

Wetlands Preservation - Alternative wetland preservation schemes are discussed in Section 2.10. Many of the wetlands preserved under the alternative plans act to improve the water quality in adjacent streams by serving as biological filters and nutrient traps for runoff waters. Therefore, while the proposed and the site-specific preservation schemes would benefit the water quality in Oak and Brushy Creeks, the USEPA areawide categorization plan and the systems preservation approach (both of which would preserve substantially more wetland acreage) would have a somewhat greater benefit to the water quality of these two creeks.

No Action or Postponement of Action - If the proposed mining operation were not undertaken, the site drainage patterns and water balance would remain the same as they are at present. If mining activities were delayed, it is possible that technological advances made during the period of delay would include the means for better water recovery from slimes and more effective methods of stream reclamation.

3.2.1.3 Mitigative Measures

A number of mitigative measures have been included in MCC's proposed plan of action. These are described in the following sections.

Reduction of Streamflow

The reduction of streamflow attributable to the mining activities would be mitigated during reclamation. Areas which were formerly isolated from natural drainage and did not contribute to streamflow would be eliminated. In addition, drainage divides would be created by land contouring to restore the natural drainage areas of affected streams. As a result, the flow on all streams after final reclamation is expected to be reasonably similar to that which existed prior to the mining activities.

Diversion of Streamflow

All flow diversions from Brushy Creek are subject to the maintenance of certain monthly minimum flows established by SWFWMD downstream of the point of diversion. These flows, which range from 0.002 cfs in May to 16.4 cfs in August, represent the average monthly minimum flows on Brushy Creek below which diversion would not be permitted. As was discussed in Section 3.2.1.2, however, no diversion would actually take place when the flow in Brushy Creek is less than 3.25 cfs. The months of October through June have average minimum flows from 0.002 cfs to 2.5 cfs. Since these values are less than 3.25 cfs, the proposed diversion arrangement reduces the likelihood for flow diversion during these months.

The remaining months of July through September have average minimum flows from 5.58 to 16.4 cfs, which are greater than 3.25 cfs. Flow during those months would normally be sufficiently great such that the proposed diversion arrangement would not reduce the monthly average flows below the specified minimum values. These months could, however, have average flows less than the minimum values during abnormally dry years. In such instances, no water would be diverted from Brushy Creek.

Effluent Discharge

The following measures would be taken to minimize the amount of effluent discharged as overflow from the clear water pond:

- The normal operating level of the clear water pond would be approximately 5 feet below the overflow point. This drawdown would provide 150 acre-feet of storage, equivalent to approximately 1.75 inches of excess rainfall, prior to pond overflow.
- During periods of excess rainfall, pumpage of ground water would be reduced to the minimum amount necessary for the amine flotation process. Pumping of water from the Brushy Creek storage basin would similarly be reduced or eliminated.
- Clay settling area overflow weirs would be raised during periods of heavy rainfall to reduce the amount of outflow reaching the clear water pond.

The following water treatment and design features would serve to further mitigate the potential impact of effluent discharge:

- Wastewaters from ore transportation, washing, flotation, and waste disposal operations would be recycled to the water recirculation system for treatment in clay settling areas, thereby substantially reducing a potential source of water pollution.
- The clay settling areas would serve as effective wastewater treatment facilities. Operating personnel would be assigned full-time to monitor and control the quality of the effluent.

Local Water Quality Degradation

The following measures could be taken to mitigate potential local water quality degradation:

- Berms would be constructed around parcels of land prior to clearing of vegetation, to prevent sediment-laden water from reaching adjacent streams. Runoff from such areas would be collected and routed to the plant recirculation system for treatment.
- Ditches would be constructed around the perimeter of clay settling area embankments to intercept and collect seepage. Such water would be routed to the plant recirculation system for treatment.
- Thick-wall pipe, extra thick gaskets, and full-bolted flanges will be used at stream and road crossings, and regular inspection of pipeline crossings will be instituted. Accidental spillage of waste clays at other locations would be prevented from reaching adjacent streams by the construction of berms identified above.

Hypothetical Clay Settling Area Embankment Failure

The following measures would be taken to reduce the possibility of a clay settling area embankment failure:

- The clay settling areas would be designed by an experienced professional engineer and be based on a thorough investigation of foundation and soil conditions existing at the proposed construction sites.
- The rules of the Florida DER for the design, construction, inspection, and maintenance of earthen dams promulgated under Chapter 17-9, Florida Administrative Code, would be strictly adhered to and complied with. The proposed mining operation would also comply with other applicable state and/or local ordinances concerning retaining dikes.
- Construction of the clay settling areas would be inspected daily by a qualified representative of the design engineer to ascertain that the embankments, spillways, and control structures meet the design specifications. Prior to the introduction of waste clay into the areas, the entire structure would be thoroughly inspected by the design engineer.
- The settling areas would be visually inspected during each eighthour shift and would be thoroughly inspected on a weekly basis by operations personnel who have been instructed by the design engineer regarding items to be checked.
- A registered professional engineer, who is experienced in the design, construction, and maintenance of earthen dams would make annual inspections of the dam systems. On a monthly basis, he would also review the reports of the operation personnel. A report of his findings would be submitted to the Florida DER.

3.2.2 Ground Water

3.2.2.1 Baseline Conditions

Aquifer Characteristics

Regionally, ground water is available in useable quantities from three hydrogeologic units: the surficial or shallow aquifer, the upper unit of the Floridan aquifer, and the lower unit of the Floridan aquifer (see Figure 3.1-2). Regional characteristics of each of the units are presented in the ADA/DRI (MCC, 1977); their site characteristics are presented here.

Lithology of the surficial aquifer at the site consists of an upper sand unit and a lower phosphorite unit. This upper sand unit consists of very fine to very coarse grained quartz sands with minor lenses of interbedded clays. Thickness varies between 5 and 40 feet and averages 20 feet. The phosphatic clay unit beneath the sand consists of a gray to greenish-gray phosphatic clay and contains interbedded lenses of clayey sand. This unit varies between 40 and 60 feet in thickness. The upper sand unit functions as the surficial unconfined aquifer while the lower phosphatic clay acts as the lower confining bed for the surficial aquifer and part of the upper confining unit of the upper Floridan aquifer. Figure 3.2-5 shows the variability in thickness of the surficial aquifer as developed from cores and logs of shallow observation wells on the property. Thicknesses and relationships between the surficial sands, the phosphatic clay unit, and the Hawthorn Formation are also shown in Figure 3.2-5.

Infiltration of precipitation is the major source of ground water. Recharge to the surficial aquifer is due to downward percolation through interconnected pore spaces. Water entering the surficial aquifer moves laterally in a direction mainly controlled by topography and lithology.

Water table levels vary seasonally. The lowest levels occur during March, April, and May, while highest levels occur during July, August, and September. Figures 3.2-6 and 3.2-7 show the water level for May and July, respectively. The average difference in water level between the two periods is about 5 feet.

Water-bearing capabilities of the surficial aquifer are variable throughout the property due to the deviations in grain size within the unit. Transmissivities determined from pumping tests range from 1.5×10^3 to 1.3×10^4 gpd/ft and average 6.5×10^3 gpd/ft. Storage coefficients ranged from 7.7×10^{-3} to 2.5×10^{-2}.

The Floridan aquifer system at the site can be divided into four units on the basis of lithology and permeability. These units are, in order of increasing depth: the first confining bed, the upper unit of the Floridan aquifer, the second confining bed, and the lower unit of Floridan aquifer (Figure 3.1-2).

The first confining bed acts as the lower confining bed for the surficial aquifer and the upper confining bed for the upper Floridan aquifer. This unit corresponds to the Bone Valley Formation in Polk County (Stewart, 1966) and the upper clays of the Hawthorn Formation. Lithic materials comprising this bed are essentially clays, sandy clays, marls, and some dense limestones. This confining bed is approximately 260 feet thick. Leakance values through this unit are less than 1×10^{-5} ft/day/ft.

Below the first confining bed lies the upper unit of the Floridan aquifer. Wilson (1977) determined this aquifer to average 150 feet throughout Hardee County; however, boring logs indicate that only about 40 feet act as an effective aquifer at the proposed site. The upper unit of the Floridan aquifer is composed of permeable limestones of the Hawthorn Formation and the Tampa Limestone. Hydraulic properties for this unit display a relatively low degree of variability, a result of the homogeneous nature of the lithic materials. Aquifer tests of the upper unit of the Floridan aquifer yielded transmissivities from 1.2×10^4 gpd/ft to 6.5×10^4 gpd/ft. Storage coefficients for the upper unit of the Floridan Aquifer ranges between 1.1×10^{-1} and 1.7×10^{-2}.

Recharge to the upper unit of the Floridan aquifer can be a product of a number of processes. Generally, recharge occurs by vertical migration of water along fractures, faults, sink holes and from downward leakage through the upper confining bed. Horizontal recharge of ground water is along bedding planes and solution features, with movement in the direction of decreasing head.

Underlying the upper unit of the Floridan aquifer at the proposed site is the upper confining bed of the lower unit of the Floridan aquifer known as the sand and clay unit of the Tampa Limestone. Generally, this bed contains dense clays and fine sands, is heterogenous in nature, and averages 140 feet in thickness. On the site, the sand and clay unit functions as a tight confining bed with leakance values less than 1×10^{-5} ft/day/ft.

The sand and clay unit of the Tampa Limestone is underlain by the lower unit of the Floridan aquifer. Lithic material included in this unit are limestones and dolostones of the Suwannee Limestone, the Ocala Group, and the Avon Park Limestone. Although the lower unit of the Floridan aquifer is composed of three different formations, it functions as a single hydrologic unit. The lower unit of the Floridan aquifer lies approximately 475 feet below land surface and ranges between 750 and 900 feet thick at the site.

At the property, a comprehensive aquifer pumping test program was implemented in order to establish the hydraulic parameters of each limestone unit. Table 3.2-7 shows the thickness and the range of values for transmissivity and storage coefficients within the Suwannee Limestone, the Ocala Group, and the Avon Park Limestone.

Ground Water Quality

The chemical quality of ground water is generally governed by equilibrium reactions involving the ground water and the lithic material contacted. Geochemically, the concentrations of chemical constituents are dependent upon the chemical composition of soils or rocks which the water is passing through, the temperature, the pH, the

Eh (redox potential), the pressure, and the duration of contact. Generally ground water having the shortest residence time has the lowest dissolved mineral content, while ground waters of long residence time have the highest mineral content. Dalton (1977) and Wilson (1977) have discussed the water quality in the three aquifers in the west-central Florida Phosphate District.

As part of earlier permit applications (MCC, 1976), chemical analyses were obtained for several ground water samples taken from the surficial aquifer, the upper unit of the Floridan aquifer, and the lower unit of the Floridan aquifer on the MCC property. In general, the ground water quality at the site is consistent with the overall regional trends in ground water quality. Water quality characteristics obtained during the sampling program are identified on Table 3.2-8. This table identifies wells from which samples were taken, the aquifer type, geologic unit, depth, and water level (MCC, 1976). Samples were analyzed for: temperature, pH, specific conductance, turbidity, iron, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, nitrate, fluoride, phosphate, total alkalinity, hardness, and total dissolved solids. All analytical results are expressed in milligrams per liter (mg/liter) unless otherwise specified.

Existing Ground Water Use

Ground water is presently used on the site for irrigation, stock watering, and domestic purposes. A well inventory prepared by P. E. LaMoreaux & Associates, Inc., identified approximately 232 wells on the site and within two miles of the property boundary. Approximately 101 of these wells are within the site proper and are listed in Table 3.2-9. Information concerning the well construction and yield, if known, is included in the table. The locations of these wells are shown on Figure 3.2-8. Of the 101 on-site existing wells, 68 were installed by MCC as part of the hydrogeologic investigations of the site. The remaining 33 wells existing on-site are irrigation, domestic, and stock watering wells.

Nine of the existing wells permitted by the Southwest Florida Water Management District under Consumptive Use Permit Nos. 27703508, 27703518, 27703519, 27703520, and 27703521 consumptively utilize 5,579,589 gallons per day on an annual average basis. This ground water is used for irrigation of improved pasture. As stated in MCC's Consumptive Use Permit No. 27703567, MCC's permitted withdrawals would include the withdrawals from the nine existing permitted wells. As MCC's withdrawals commenced, ground water withdrawals from these existing wells would be reduced and ultimately terminated to ensure that the maximum withdrawal rates specified in MCC's permit were not exceeded.

Other existing on-site wells would be abandoned during the mining operations. Shallow aquifer wells would be physically removed as the overburden sands were stripped. Floridan aquifer wells would be abandoned in accordance with the Rules of the Department of Environmental Regulation, Chapter 17-21, "Rules and Regulations Governing Water Wells in Florida." The abandonment procedure would involve plugging the well from the bottom to top with neat cement grout.

3.2.2.2 Environmental Impacts

MCC's Proposed Action

Potential ground water impacts are primarily related to ground water withdrawals for production water usage and to mine dewatering activities. The potential impacts on ground water levels and quality resulting from these activities are discussed in this section.

Ground Water Usage - Withdrawals from the lower unit of the Floridan aquifer would provide much of the process make-up water. The total withdrawal is limited to 16,981,920 gallons per day (gpd) on an annual average basis and 33,850,500 gpd on a maximum daily basis by the Southwest Florida Water Management District (SWFWMD) in MCC's Consumptive Use Permit No. 27703567 (Appendix D). The withdrawals can be made from six production wells during the first three years of mining.

Thereafter, surface water usage would be maximized, reducing withdrawal from the lower unit of the Floridan aquifer to approximately 11,896,000 gpd.

Five of the production wells would withdraw ground water from the lower unit of the Floridan aquifer for use as process make-up water (Figure 3.2-9). The remaining well would be used for potable water withdrawn from the upper unit of the Floridan aquifer. Potable water withdrawals are limited to 10,080 gpd and 10,500 gpd on an annual average and maximum daily basis, respectively.

Ground water would also be used to supply approximately 430,000 gpd for seal water for centrifugal pumps on the matrix and sand tailings slurry transport lines. This water would be withdrawn from the upper unit of the Floridan aquifer. Necessary wells would be installed and abandoned frequently as the locations of the centrifugal pumps changed.

Ground water withdrawals from the lower unit of the Floridan aquifer would lower potentiometric levels in the aquifer near the pumping wells, as shown on Figure 3.2-10. Maximum drawdowns of approximately 7.4 feet would be experienced at the proposed production well MCLF-6. The maximum drawdown at the site boundaries is projected to be about 3.3 feet. These drawdowns are relatively small so that the potentiometric surface within the lower unit of the Floridan aquifer would not be significantly affected. Water levels in the upper unit of the Floridan aquifer and the shallow water table aquifer should not be affected by production withdrawals. Pumping tests conducted by P.E. LaMoreaux and Associates, Inc. in 1976 showed no leakance in confining beds overlying the lower Floridan aquifer. Water levels in upper aquifers were not affected by these tests.

Off-site, but significant, existing ground water usage occurs in the town of Ona, located in the southeastern portion of the site. Forty-one shallow, domestic wells withdraw ground water for use at individual dwellings. One Floridan aquifer well is also used for industrial purposes. Figure 3.2-11 shows the locations of these wells.

significant variations in ground water quality were observed. Also, water level drawdowns which would result from the proposed water withdrawal are of insufficient magnitude to cause vertical salt water migration from deeper sections of the aquifer to the production zones. In addition, no evidence was seen of water quality deterioration due to highly mineralized ground water commonly occurring in evaporite deposits of the Lake City Limestone. These evaporites occur at approximately 1,600 feet below ground surface in the area (Dames & Moore, 1975). The production wells would be completed to only approximately 1,250 feet below ground surface.

The potential for sinkhole development due to the depressed potentiometric levels is minimal. Thick sequences of competent limestone overlying the lower Floridan aquifer, a lack of surface karstic features in the area, and minimal potentiometric level reductions due to pumping result in an insignificant increase in the potential for sinkhole development.

Approximately 14,084,640 gpd of the total make-up water required for the project would be consumptively used and not returned to the hydrogeologic system. The water would be entrapped in clay wastes, sand tailings, and product. The consumptive use would be approximately 96 percent of the excess annual precipitation falling on the site. SWFWMD defines this excess precipitation as the water crop, which is precipitation less evapotranspiration. Since the consumptive use is less than the water crop, the withdrawals should not result in a long-term negative effect on water quantities at the site.

Ground water withdrawals from the upper unit of the Floridan aquifer would be utilized for potable and pump seal water. Potable water demands are projected to be 10,080 gpd (approximately 7 gallons per minute) and would not adversely stress the upper Floridan aquifer or the shallow aquifer.

Pump sealing water demands would also be satisfied by utilizing the upper Floridan aquifer; approximately 430,000 gpd would be withdrawn from the aquifer. The effect of pumping 500 gpm from the upper Floridan aquifer in a single well was calculated and is shown on Figure 3.2-12. Drawdowns would decrease relatively rapidly with increased distance from the well. Since these drawdowns would be relatively small, no significant impact should be realized from withdrawals for sealing water.

Farmland Industries, Inc. plans to withdraw pump seal water for its phosphate mining operations from the shallow aquifer (USEPA, 1981). During pumping tests conducted by MCC on the upper Floridan aquifer, no appreciable shallow aquifer water level fluctuations were observed (LaMoreaux, 1976). Leakance through the confining bed separating the upper Floridan and shallow aquifers is minimal. The shallow aquifer water levels should not, therefore, be affected by MCC's sealing water withdrawals.

Potable water withdrawn from the upper unit of the Floridan aquifer, and not consumptively utilized, would be discharged to the recirculating mine circuit water as sanitary effluent. Since this discharge would be less than 7 gpm and the mine circuit recirculation would be several thousand gallons per minute, no observable water quality changes should be experienced in the recirculation system.

Mine Dewatering Impacts - The dewatering of mine pits would be necessary in order to effectively extract the phosphatic matrix. The matrix underlies the surficial sand which contains the shallow water table aquifer. These surficial sands (overburden) would be stripped from the top of the matrix and temporarily stockpiled adjacent to the mine cut. Ground water contained within the overburden would then flow into the mine pits and would have to be removed. As a result of these dewatering activities, shallow aquifer water levels would be lowered in the vicinity of the mine cuts. The distance these levels would be lowered and the areas that would be affected are related to the aquifer hydraulic properties, the geometry of the mine cut, and the length of time mine pit dewatering continues.

The factors affecting water table level depression due to mine cut dewatering vary widely across the site. The impacts of these activities can only be discussed in general terms. Ground water levels in the shallow aquifer adjacent to mine cuts could be appreciably lowered due to seepage into the cut. These water level declines have been projected based on typical shallow aquifer hydraulic characteristics. The results of these calculations are shown on Figure 3.2-13. Depending on the saturated thickness of the water table aquifer, 3 feet of drawdown in the shallow aquifer might be experienced as far as 600 feet from the mine cut. MCC's Consumptive Use Permit limits drawdowns in the shallow aquifer at the property boundaries to 3 feet. Excessive water level declines in the off-site sections of the shallow aquifer could impact existing shallow aquifer users. These declines might lower water levels below the intake portions of existing wells and reduce the availability of shallow ground water to existing off-site users. The decline of water levels due to mine cut dewatering might also significantly reduce water levels in adjacent wetlands, croplands, pastures, or sensitive areas. The lowered levels might reduce the availability of water for vegetation in these areas. MCC plans to construct cut-off trenches or rim-ditches around mining cuts where such effects could cause adverse impacts (Section 3.2.2.3).

The impacts from mine cut dewatering would be temporary and local. When mining ceases in an area, mine dewatering activities would be terminated and water levels would rise to near ambient levels. As described later, measures are planned to reduce the short-term negative impacts from dewatering.

Other Impacts - Waste clays and sand tailings storage areas might affect the shallow aquifer ground water quality. Although specific data necessary to predict water quality in the waste clays and sand tailings is not available, it is expected that ground water quality in the immediate vicinity of these areas would change. Below and immediately adjacent to these facilities, changes in pH, total dissolved solids, specific conductance, fluoride, phosphate, and alkalinity might be realized. Due to the very low permeability developed in the waste clay as the moisture content decreases, the quantity of water seeping from the clay storage area would be minimal. The effects of this seepage on ground water quality should, therefore, be very limited.

Water quality changes resulting from sand tailings storage should also be insignificant. Sand tailings are predominantly silica, which has a low solubility in water. Ground water quality changes below and adjacent to the sand tailings storage areas would, as a result, be related mainly to the sand tailings slurry water quality.

Alternatives

The impacts of the mining method, site location, matrix transport, liquid effluent disposal, rock drying, wetlands preservation, and product transport alternatives are similar to those of the proposed plan. Impacts discussed in Section 3.2.1.2 (Alternatives) for the ore processing, water source, "no action," and postponement of action alternatives also apply to ground water impacts. The discussion provided in Section 3.2.1.2 for waste disposal/reclamation is likewise applicable to impacts on ground water, with the following additions:

1. The larger acreage of clay storage included in the conventional waste disposal method provides for catchment and storage of rain water, reducing the need for ground water resources, while the lower acreage of these areas in the sand/clay mix method has the opposite impact.
2. In areas where clays or sand/clay mixes were used in reclamation, the water-yielding capabilities of the shallow aquifer would be impaired.

3.2.2.3 Mitigative Measures

Several measures are planned, recommended or required to mitigate potential adverse impacts on ground water. These measures are discussed below.

The Consumptive Use Permit (Number 27703567) issued to MCC by SWFWMD contains several conditions required to mitigate potential impacts. These are summarized as follows:

1. Commencing with the fourth year of mining, ground water withdrawals for process make-up water shall decrease by maximizing withdrawals of surface water from the Brushy Creek Storage Basin.
2. The permitted ground water withdrawals are inclusive of existing users at the site. Total withdrawals from the ground water system at the property shall not exceed the permitted quantities including existing withdrawals.
3. Ground water level and quality monitoring is required to detect changes in the hydrogeologic regime due to the mining activities. The monitoring includes monitoring of the fresh/mineralized water interface at depth in the lower Floridan aquifer.
4. Prior to dewatering mine pits within 450 feet of the property boundaries, MCC must obtain written consent of adjacent property owners before lowering water table levels.

In addition to the permit conditions for impact mitigation, MCC is planning further actions to mitigate the effects of mine cut dewatering. Where the dewatering would lower water table levels so as to cause adverse impacts, MCC plans to construct cutoff trenches. These trenches are shallow, linear excavations installed between the mine cut and the area of concern. The trench is recharged by pumping water from the mine pit to the trench, which causes the cutoff trench to act as a recharge boundary. Therefore, water level declines are not experienced in the shallow aquifer beyond the trench but are limited to the area between the mine pit and trench. A berm is constructed between the mine pit and trench to contain surface water runoff and pumped water in the ditch and areas beyond.

As required by state regulations, appropriate well construction and abandonment procedures for all production and sealing water wells must be followed. These procedures have been established, in part, to prevent the drainage of upper aquifer waters to lower aquifers through poor well construction and abandonment techniques. These procedures would be adhered to in order to prevent unnecessary changes in ground water levels or quality, especially where the frequently abandoned and installed sealing water wells are concerned.

TABLE 3.2-1

STREAMS RECEIVING MCC SITE DRAINAGE

Basin/Creek	Site Area Which Drains Into Creek	
	Acres	Percent
Peace River Basin		
Oak Creek	5,738	38.6
Hickory Creek	1,316	8.9
Troublesome Creek	51	0.3
Total	7,105	47.8
Horse Creek Basin		
Brushy Creek	6,959	46.9
Horse Creek	588	4.0
Lettis Creek	198	1.3
Total	7,745	52.2

Source: MCC, 1977.

TABLE 3.2-2

WATER QUALITY SUMMARY
PEACE RIVER AND HORSE CREEK BASINS

Parameter[a]	Peace River			Horse Creek		
	Avg.	Max.	Min.	Avg.	Max.	Min.
Temperature (°C)	24.2	31.5	14.0	24.3	32.0	12.5
Dissolved Oxygen	7.1	10.4	5.1	6.7	13.2	3.5
pH (su)	6.7	7.8	4.2	7.1	8.6	5.7
Specific Conductance (µmhos/cm)	401	590	100	283	900	60
Fecal Coliform (col/100 ml)	23	86	2	51	690	2
Biochemical Oxygen Demand	1.0	1.9	0.0	3.0	30.5	0.1
Total Organic Carbon	10.4	20.0	5.0	17.3	36.0	4.0
Color (CPU)	72	200	8	168	480	30
Turbidity (JTU)	6.1	15	1.0	-	-	-
Suspended Solids	7	13	4	-	-	-
Dissolved Solids	276	392	132	-	-	-
Total Solids	-	-	-	315	1025	64
Total Acidity (as $CaCO_3$)	-	-	-	14	72	0
Total Alkalinity (as $CaCO_3$)	58.5	117	24.0	135	333	11
Sulfate	105	180	24	92	359	2
Fluoride	1.6	2.7	0.7	0.29	0.45	0.00
Total Phosphate (as P)	3.59	28.0	0.14	0.56	1.00	0.31
Total Orthophosphate (as P)	3.00	21.0	0.13	0.50	2.80	0.06
Ammonia (as N)	0.11	0.88	0.01	0.10	0.36	0.00
Nitrate (as N)	1.42	4.40	0.00	0.10	0.44	0.00
Organic Nitrogen (as N)	0.91	1.90	0.27	1.13	2.25	0.00
Iron	0.28	0.83	0.05	-	-	-
Aluminum	0.18	0.40	0.00	-	-	-
Arsenic	0.003	0.010	0.001	-	-	-

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[a] Units are mg/liter unless otherwise noted.

Source: Environmental Science and Engineering, Inc., 1977.

TABLE 3.2-3

WATER QUALITY SUMMARY
BRUSHY AND OAK CREEKS

Parameter[a]	Brushy Creek Avg.	Brushy Creek Max.	Brushy Creek Min.	Oak Creek Avg.	Oak Creek Max.	Oak Creek Min.
Temperature (°C)	24	31	15	23	31	16
Dissolved Oxygen	5.9	9.6	0.5	2.9	12.2	0.4
pH (su)	6.1	7.2	5.0	5.5	6.8	4.6
Specific Conductance (μmhos/cm)	150	280	76	160	350	68
Fecal Coliform (col/100 ml)	120	300	10	60	210	10
Biochemical Oxygen Demand	2.8	5.8	1.0	2.1	4.4	1.0
Total Organic Carbon	33	53	15	36	53	23
Color (CPU)	370	510	49	380	570	140
Turbidity (NTU)	5	32	1.0	3	21	1.0
Suspended Solids	7	18	1.0	6	26	1.0
Total Solids	160	220	110	160	280	110
Oil and Grease	<5	5.0	<5	<5	<5	<5
Total Acidity (as $CaCO_3$)	13	34	3.0	23	49	7.0
Total Alkalinity (as $CaCO_3$)	35	104	8.0	27	100	4.0
Sulfate	7	14	2.0	7	28	1.0
Fluoride	0.36	0.50	0.26	0.26	0.41	0.14
Total Phosphate (as P)	0.74	1.60	0.05	0.51	1.2	0.06
Total Orthophosphate (as P)	0.50	1.30	0.05	0.35	1.0	0.04
Ammonia (as N)	0.16	0.81	0.05	0.16	0.27	0.05
Nitrate (as N)	0.06	0.20	0.002	0.07	0.30	0.002
Organic Nitrogen (as N)	1.4	3.8	5.0	1.3	2.4	0.5
Iron	0.9	1.7	0.12	0.8	1.8	0.1
Aluminum	1.22	2.0	0.5	1.19	2.0	0.1
Arsenic	<0.02	0.03	0.01	<0.02	0.03	0.01

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[a] Units are mg/liter unless otherwise noted.

Source: Environmental Science and Engineering, Inc., 1977.

TABLE 3.2-4

CHEMICAL COMPOSITION OF EFFLUENT DISCHARGE

Parameter[a]	Value
Temperature (°F)	55 (winter) - 85 (summer); avg.
Dissolved Oxygen (mg/l)	7.5 - 10.0
pH (su)	6.0-9.0
Specific Conductance (μmhos/cm)	200-900
Total Suspended Solids	0-60 (30 avg.)
Oil and Grease	15 (avg.)
Nitrate	0.92-1.00
Nitrite	<0.001-0.014
Total Phosphorus	1.80-2.70
Sulfate	44.44-89.29
Chloride	17.10-19.60
Fluoride	1.20-1.81
Aluminum	0.19 (avg.)
Calcium	53.9-66.4
Iron	0.019-0.023
Magnesium	17.6-19.8
Manganese	0.006-0.017
Potassium	1.1-1.7
Sodium	8.8-8.9
Radium-226 (pCi/l)	1.0

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[a] Expressed in mg/l unless otherwise specified.

Source: NPDES Permit Application (proposed discharge) values for temperature, pH, specific conductance, total suspended solids, oil and grease, and aluminum. Expected values for dissolved oxygen were derived from measurements made at another phosphate mining operation in Florida. The predicted Ra-226 concentration was calculated from maximum expected dissolved (Guimond and Windham, 1975) and suspended solids loadings in the effluent and from Ra-226 concentrations in the clay wastes (Table V B-3). Values for other parameters based upon analysis of supernatant liquid from two clay samples from the mine property - not taken from the NPDES permit application.

TABLE 3.2-5

EFFLUENT LIMITATIONS FOR NEW SOURCES

Agency/Parameter	1-Day Maximum	30-Day Average
USEPA		
Total Suspended Solids (mg/l)	60	30
pH (su)	6.0-9.0	6.0-9.0
Florida DER		
Total Suspended Solids (mg/l)	60	30
Total Fixed Solids (mg/l)	25	12
Total Phosphorus (mg/l)	5	3
pH (su)	6.0-9.0	6.0-9.0

Source: USEPA Regulations - 40 CFR 136, subpart R. Florida Regulations - Rules of Department of Environmental Regulation, Chapter 17-6.

TABLE 3.2-6

EFFECTS OF EFFLUENT DISCHARGE ON AMBIENT WATER QUALITY

Parameter[a]	Parameter Concentrations		Fully Mixed Stream Quality								Florida Standards[b]
			June		July		August		September		
	Effluent	Ambient	Average Effluent Discharge	Maximum Effluent Discharge	Average Effluent Discharge	Maximum Effluent Discharge	Average Effluent Discharge	Maximum Effluent Discharge	Average Effluent Discharge	Maximum Effluent Discharge	
Temperature (°F)	85	87.8	86.1	85.5	86.7	85.8	86.7	86.0	86.9	86.2	92 max.
pH (su)	6.0	4.6	4.9	5.2	4.8	5.0	4.8	5.0	4.7	4.9	6.0 min.
pH (su)	9.0	6.8	7.1	7.4	6.9	7.2	6.9	7.1	6.9	7.0	8.5 max. or 1.0 max.
pH (su)	9.0	4.6	5.0	5.3	4.8	5.1	4.8	5.0	4.8	5.0	change from ambient
Sp. Cond. (mhos/cm)	900	350	667	788	571	713	539	681	516	656	500 max. or 100% max.
Sp. Cond. (µ mhos/cm)	900	68	547	731	403	618	355	569	320	531	change from ambient
Total Suspended Solids	30	6	19.8	25.1	15.7	21.9	14.3	20.5	13.3	19.3	—
Oil and Grease	15	<5	<10.8	<13.0	<9.0	<11.6	<8.4	<11.0	<8.0	<10.6	5.0 max.
Nitrate	0.96	0.07	0.58	0.78	0.43	0.66	0.38	0.61	0.34	0.57	—
Nitrite	0.007	—	0.004[c]	0.010[c]	0.003[c]	0.005[c]	0.002[c]	0.004[c]	0.002[c]	0.004[c]	—
Total Phosphate	2.25	0.51	1.51	1.90	1.21	1.66	1.11	1.56	1.04	1.48	—
Sulfate	66.87	7.0	41.47	54.70	31.11	46.55	27.62	43.09	25.12	40.30	--
Chloride	18.35	--	10.56[c]	14.62[c]	7.39[c]	12.12[c]	6.32[c]	11.10[c]	5.55[c]	10.2	—
Fluoride	1.51	0.26	0.98	1.26	0.76	1.09	0.69	1.01	0.64	0.96	10.0 max.
Aluminum	0.19	1.19	0.61	0.39	0.79	0.53	0.85	0.59	0.89	0.63	—
Calcium	60.2	--	34.7[c]	48.0[c]	24.2[c]	39.8[c]	20.7[c]	36.3[c]	18.2	33.5[c]	—
Iron	0.021	0.8	0.35	0.18	0.49	0.29	0.53	0.33	0.56	0.37	--
Magnesium	18.7	—	10.8[c]	14.9[c]	7.5	12.4[c]	6.4[c]	11.3[c]	5.7[c]	10.4[c]	1.0 max.
Manganese	0.012	—	0.01[c]	0.010[c]	.005[c]	0.008[c]	0.004[c]	0.007[c]	0.004[c]	0.007[c]	—
Potassium	1.4	--	0.81[c]	1.12[c]	0.56[c]	0.92[c]	0.48[c]	0.84[c]	0.42[c]	0.78[c]	—
Sodium	8.9	--	5.1[c]	7.1[c]	3.6[c]	5.9[c]	3.1[c]	5.4[c]	2.7[c]	4.9[c]	—

---

[a] Expressed in mg/l unless otherwise specified.

[b] Pertain to levels in receiving water body, except temperature standard which pertains to effluent. Includes general and Class III water quality criteria.

[c] No ambient water quality data exist. Values represent maximum increase in concentration which could occur due to effluent discharge.

TABLE 3.2-7

HYDRAULIC PARAMETERS OF LIMESTONE UNITS

Limestone Unit	Thickness (ft.)	Transmissivity (gpd/ft)	Coefficient of Storage
		Range	Range
Suwannee	240	1.5×10^5 - 1.9×10^5	1.3×10^{-8} - 4.5×10^{-6}
Ocala Group	265	7.3×10^5 - 9.0×10^5	8.2×10^{-6} - 1.1×10^{-5}
Ocala Group and Avon Park	510	1.0×10^6 - 1.5×10^2	7.9×10^{-4} - 1.4×10^{-2}

TABLE 3.2-8

MISSISSIPPI CHEMICAL CORPORATION RESULTS OF GROUND WATER QUALITY ANALYSES

Well Number	Aquifer[a]	Geologic Unit[b]	Depth	Water Level (ft. BGS)	Date of Collection	Temp. (°C)	pH	Specific Conductance (micromhos/cm)	Turbidity (JTU)	Fe	Ca	Mg	Na	K	HCO_3	SO_4	Cl	NO_3	F	PO_4	Total Alkalinity	Hardness	Total Dissolved Solids
MCRW 1	SA	Pleist	40	11.19	03-11 1976	25	6.5	113	-	0.3	11	2.9	3.7	1.1	46.5	2.0	6.0	9.7	0.2	0.4	36	-	-
MCSA 7	SA	Pleist	20		07-08 1976	—	5.9	99	-	0.5	2.4	1.0	8.9	6.72	-	9	14	0.23	0.5	1.70	10	10	68
MCSA 9	SA	Pleist	20		07-07 1976	—	5.3	81	-	0.6	4.0	0.5	13.8	0.26	-	5	9	0.10	1.4	4.12	16	12	54
MCSA 15	SA	Pleist	20		07-07 1976	—	5.4	67	-	0.4	4.8	1.0	6.6	0.88	-	3	7	0.07	0.4	1.05	14	16	48
MCSA 16	SA	Pleist	20		07-06 1976	—	5.5	116	-	2.2	7.2	2.4	17.6	1.72	-	12	12	0.14	0.9	5.05	32	24	98
MCSA 14	SA	Pleist	20		07-12 1976	—	5.8	113	78	-	18	1.5	3.6	1.08	-	1.00	5.0	0.09	1.0	6.06	48.0	-	76
MCLF 1	UF	HA, TA	310	44.61	01-05 1976	24.4	7.3	515	0.1	<0.1	38.1	27.0	24.0	3.0	229	10	43	0.04	5.0	<0.01	177	208	360
MCLF 1	UF	HA, TA	310	44.61	01-08 1976	24.4	7.0	490	0.6	<0.1	45.8	24.0	18.0	2.8	205	38	34	0.03	3.1	<0.01	159	212	343
MCLF 1	LF	SW	710	38.87	02-12 1976	25	7.6	392	0.9	-	51	17	6.1	1.2	197	31	10	0.001	0.49	0.032	140	196	244
MCLF 1	LF	SW	710	38.87	02-14 1976	25	7.4	405	0.2	-	53	17	6.8	1.2	207	33	11	0.001	0.48	<0.01	140	200	232
MCLF 1	LF	OC	860	31.24	03-08 1976	28	7.6	375	2.1	-	54	15	6.4	1.5	215	50	8.0	0.01	0.52	0.04	140	196	280
MCLF 1	LF	OC, AP	1201	28.11	03-24 1976	28	7.4	410	0.5	-	53	14	5.4	1.6	176	60	8.0	0.10	0.5	0.03	144	190	276
MCLF 1	LF	OC, AP	1201	28.11	04-05 1976	28.5	7.4	402	0.1	-	53	18	5.4	1.5	180	60	9.0	0.02	0.5	0.03	148	206	292

Results in mg/liter unless otherwise indicated.
Source: P.E. LaMoreaux and Associates, Inc., 1976.
[a] SA = Surficial Aquifer; UF = Upper Floridan Aquifer; LF = Lower Floridan Aquifer
[b] Pleist = Pleistocene to Holocene; HA = Hawthorn Formation; TA = Tampa Formation; SW = Suwannee Limestone; OC = Ocala Group; AP = Avon Park Limestone

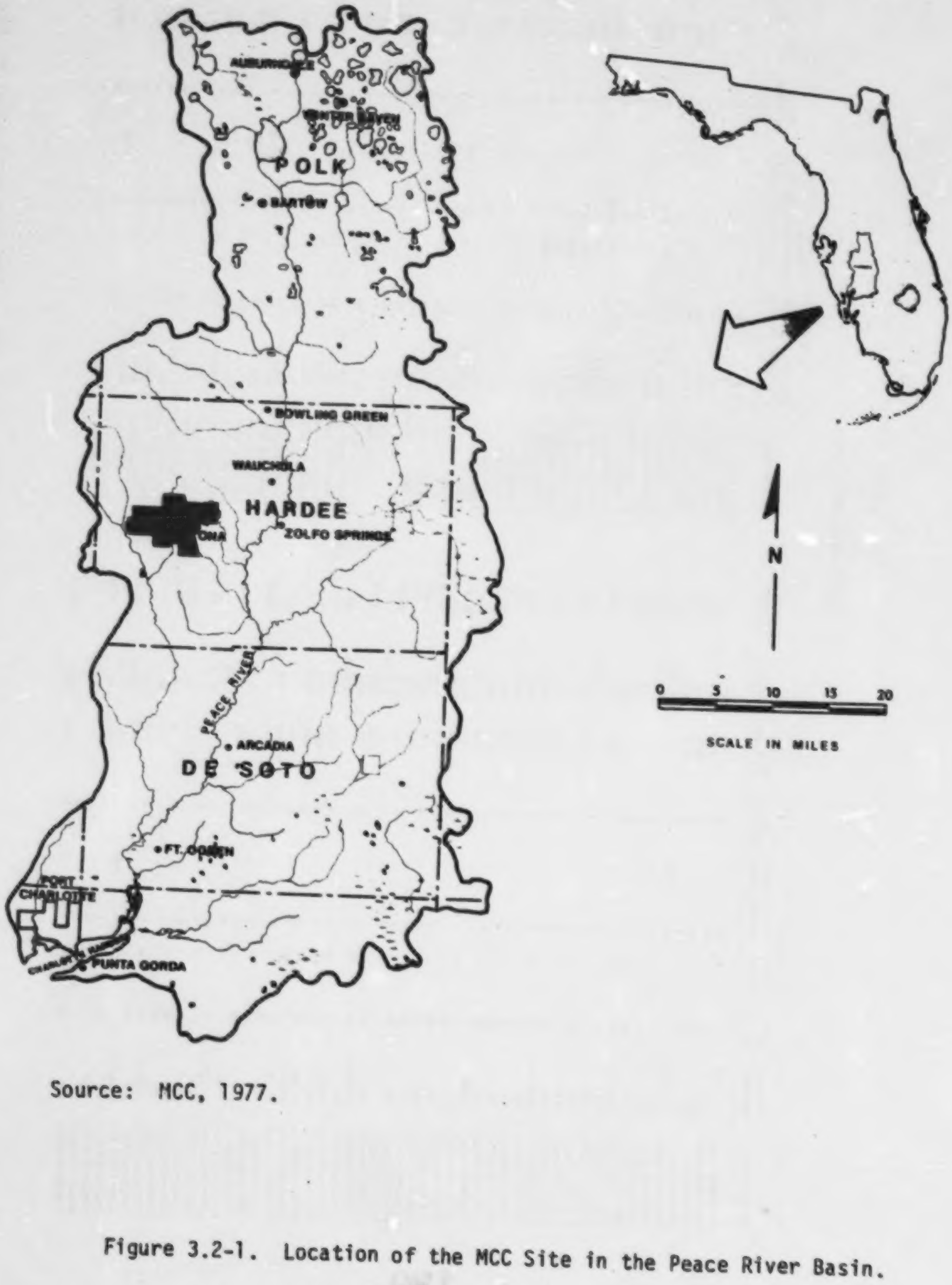
TABLE 3.2-9

WATER WELL INVENTORY

WELL NUMBER	OWNERS NUMBER	DEPTH IN FEET	CASING DEPTH IN FEET	CASING DIAM. IN INCHES	YIELD GPM	WELL PURPOSE	YEAR DRILLED	OWNER	ELEVATION OF WELL
272713N0815459.1	MCSA-13	15	6	6	–	O	1976	MCC	–
272723N0815500.1	P22	35	–	2	–	O	1975	MCC	80.30
272742N0815611.1	P21	45	–	2	–	O	1975	MCC	78.93
272807N0815647.1	P20	45	–	2	–	O	1975	MCC	82.85
272811N0815545.1	W-12, DW-9	–	–	12	2000	I	–	Sue Smith	82.85
272812N0815539.1	W-11	–	–	–	–	S	–	Sue Smith	80.42
272816N0815457.1	P43	40	–	2	–	O	1976	MCC	83.28
272820N0815719.1	P19	40	20	2	–	O	1975	MCC	78.75
272820N0815719.2	MCSA-9	20	10	6	–	O	1976	MCC	–
272820N0815818.1	P31	18	–	2	–	O	1976	MCC	81.89
272830N0815461.1	W-32	–	–	3	–	S	–	D. Carlton	–
272841N0815617.1	P44	30	–	2	–	O	1975	MCC	87.82
272842N0815626.1	W-33	–	–	4	–	–	–	Sue Smith	86.29
272848N0815433.1	P42	40	–	2	–	O	1975	MCC	80.78
272849N0815517.1	MCSA-14	20	10	6	–	O	1976	MCC	–
272852N0815551.1	P23	40	–	2	–	O	1975	MCC	82.15
272858N0815804.1	P41	16	–	2	–	O	1976	MCC	79.63
272906N0815614.1	P24	25	–	2	–	O	1975	MCC	91.78
272907N0815627.1	P10	25	–	2	–	O	1976	MCC	82.80
272908N0815828.1	MCSA-8	15	5	6	–	O	1976	MCC	–
272911N0815725.1	P11	18	–	2	–	O	1975	MCC	85.70
272912N0815803.1	P30	12	–	2	–	O	1975	MCC	83.11
272912N0815844.1	P28	42	–	2	–	O	1975	MCC	94.18
272914N0820043.1	P29	25	–	2	–	O	1975	MCC	94.48
272915N0815458.1	P9	45	–	2	–	O	1975	MCC	81.78
272915N0815854.1	P15	45	–	2	–	O	1976	MCC	89.06
272919N0815830.1	–	–	–	2	–	D	–	D. Ward	–
272935N0815330.1	P35	48	–	2	–	O	1975	MCC	86.82
272936N0815400.1	MCSA-15	20	10	6	–	O	1976	MCC	–
272938N0815359.1	W-6	–	–	2	–	–	–	D. Ward	88.8
272944N0820011.1	MCRO-1	30	10	8	–	R	1976	MCC	–
272944N0820011.2	MCRO-2	30	10	8	–	O	1976	MCC	–
272944N0820011.3	MCRO-3	30	10	8	–	O	1976	MCC	–
272944N0820011.4	MCRO-4	340	182	4	–	O	1976	–	–
272944N0820011.5	MCRW-1	348	73	8	–	O	1976	MCC	–
272945N0820022.1	P18	45	–	2	–	O	1975	MCC	100.87
272948N0815403.1	–	–	–	2	–	D	–	–	–
272948N0815811.1	P14	23	–	2	–	O	1975	MCC	84.06
272950N0815420.1	W-30	–	–	3	–	–	–	D. Ward	–
272950N0815752.1	W-5, DW-7	–	–	12	–	–	–	D. Carlton	88.18
272951N0815624.1	W-38	–	–	3	–	S	–	D. Carlton	–
272952N0815552.1	P33	40	–	2	–	O	1975	MCC	88.80
272954N0815632.1	P12	25	–	2	–	O	1975	MCC	87.44
272954N0820156.1	P40	66	–	2	–	O	1975	MCC	101.66
272954N0820156.2	MCSA-7	20	10	6	–	O	1976	MCC	–
272958N0815433.1	P7	45	–	2	–	O	1975	MCC	102.87
272958N0815716.1	W-38, DW-6	–	–	12	2000	I	–	D. Carlton	89.30
272959N0815301.1	P46	45	–	2	–	O	1975	MCC	100.89
272959N0815419.1	W-29	–	–	2	–	–	–	D. Ward	–
273002N0815403.1	–	–	–	2	–	D	–	–	–
273003N0815237.1	P34	30	–	2	–	O	1976	MCC	101.29
273006N0815819.1	P38	31	–	2	–	O	1975	MCC	–
273008N0815404.1	–	–	–	2	–	D	–	D. Ward	–
273008N0815600.1	W-4	–	–	4	–	–	–	D. Carlton	89.24
273010N0815724.1	P27	41	–	2	–	O	1976	MCC	107.77
273017N0815854.1	P49	45	–	2	–	O	1976	MCC	87.81
273021N0815623.1	P5	40	–	2	–	O	1976	MCC	86.89
273024N0815607.1	MCLF-3	1205	782	12/8	–	O	1976	MCC	–
273025N0815328.1	P48	30	–	2	–	O	1975	MCC	101.89
273025N0815509.1	–	–	–	2	–	D	–	–	–
273026N0815441.1	W-31	–	–	2	–	S	–	D. Ward	–
273028N0815607.1	MCLF-1	1200	780	16/12	–	T	1976	MCC	95.80
273028N0815607.2	MCSA-1	12	2	6	–	O	1976	MCC	96.00
273028N0815608.1	MCLF-2	1140	720	12/8	–	O	1976	MCC	–
273028N0815608.2	MCLF-4	710	480	8	–	O	1976	MCC	–
273029N0815605.1	MCLF-5	1205	753	8/8	–	O	1976	MCC	–
273029N0815605.2	MCUF-1	264	109	8	–	O	1976	MCC	–
273032N0815642.1	P4	42	–	2	–	O	1975	MCC	94.78
273033N0815807.1	P13	20	–	2	–	O	1975	MCC	87.86
273034N0815353.1	W-7, DW-1	878	–	12	2000	I	–	D. Ward	108.2
273035N0815404.1	P26	46	–	2	–	O	1975	MCC	107.10
273035N0815823.1	W-10	–	–	3	–	–	–	D. Carlton	90.89
273038N0815415.1	W-28, DW-2	–	–	10	1500	–	–	D. Carlton	108.82
273038N0815431.1	P37	42	–	2	–	O	1975	MCC	107.77
273038N0815715.0	W-26, DW-5	617	10	8	2000	I	–	D. Ward	91.48
273040N0815508.1	–	–	–	2	–	D	–	–	–
273041N0815641.1	W-9	–	–	2	–	S	–	D. Carlton	97.70
273043N0815817.1	P16	45	–	2	–	O	1975	MCC	93.89
273043N0820016.1	P17	45	–	2	–	O	1976	MCC	104.13
273045N0815808.1	–	–	–	2	–	D	–	D. Ward	–
273045N0815606.1	P32	38	–	2	–	O	1975	MCC	97.81
273045N0815819.1	W-24, DW-8	–	–	12	2000	–	–	D. Ward	94.74
273049N0815804.1	MCSA-5	20	10	6	–	O	1976	MCC	–
273049N0820018.1	MCSA-6	20	10	6	6	O	1976	MCC	–
273050N0815728.1	W-2	–	–	2	–	S	–	D. Carlton	97.86
273050N0815730.1	P3	60	–	2	–	O	1976	MCC	90.71
273052N0815535.1	W-8, DW-3	60	–	12	2000	I	–	D. Carlton	90.6
273058N0815424.1	P6	30	–	2	–	O	1975	MCC	108.70
273108N0815636.1	P39	60	–	2	–	O	1975	MCC	98.13
273108N0815413.1	–	210	130	4	30	D	1971	–	–
273110N0815303.1	P8	46	–	2	–	O	1976	MCC	103.66
273110N0815303.2	MCSA-16	20	10	6	–	O	1976	MCC	–
273113N0815338.1	P36	48	–	2	–	O	1976	MCC	107.20
273115N0815428.1	W-37	–	–	2	–	–	–	–	–
273119N0815638.1	MCSA-2	10	1	6	–	O	1976	MCC	–
273127N0815653.1	P1	53.5	–	2	–	O	1975	MCC	101.16
273127N0815726.1	P25	30	–	2	–	O	1976	MCC	91.83
273135N0815635.1	W-22	–	–	2	–	S	–	M. Olliff	104.78
273138N0815630.1	W-21, DW-4	–	–	12	2000	I	–	M. Olliff	104.86
273143N0815658.1	P2	60	–	2	–	O	1975	MCC	99.37
273147N0815618.1	W-20	–	–	2	–	S	–	M. Olliff	103.66

Source: MCC, 1977.

Note: The principal purposes of the wells are indicated by the following symbols: I, irrigation; O, observation; T, test; R, recharge connector; D, domestic; S, stock-watering; and dash (-) unknown or unused.


AUBURNDALE
WINTER HAVEN
POLK
BARTOW
BOWLING GREEN
WAUCHULA
HARDEE
ONA
ZOLFO SPRINGS
PEACE RIVER
ARCADIA
DE SOTO
FT. OGDEN
PORT CHARLOTTE
CHARLOTTE HARBOR
PUNTA GORDA
N
0 5 10 15 20
SCALE IN MILES

Source: MCC, 1977.

Figure 3.2-1. Location of the MCC Site in the Peace River Basin.

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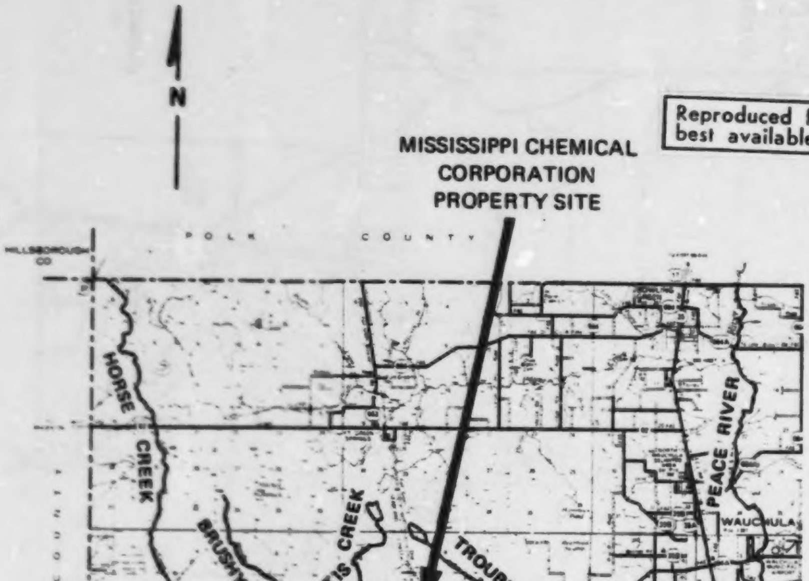
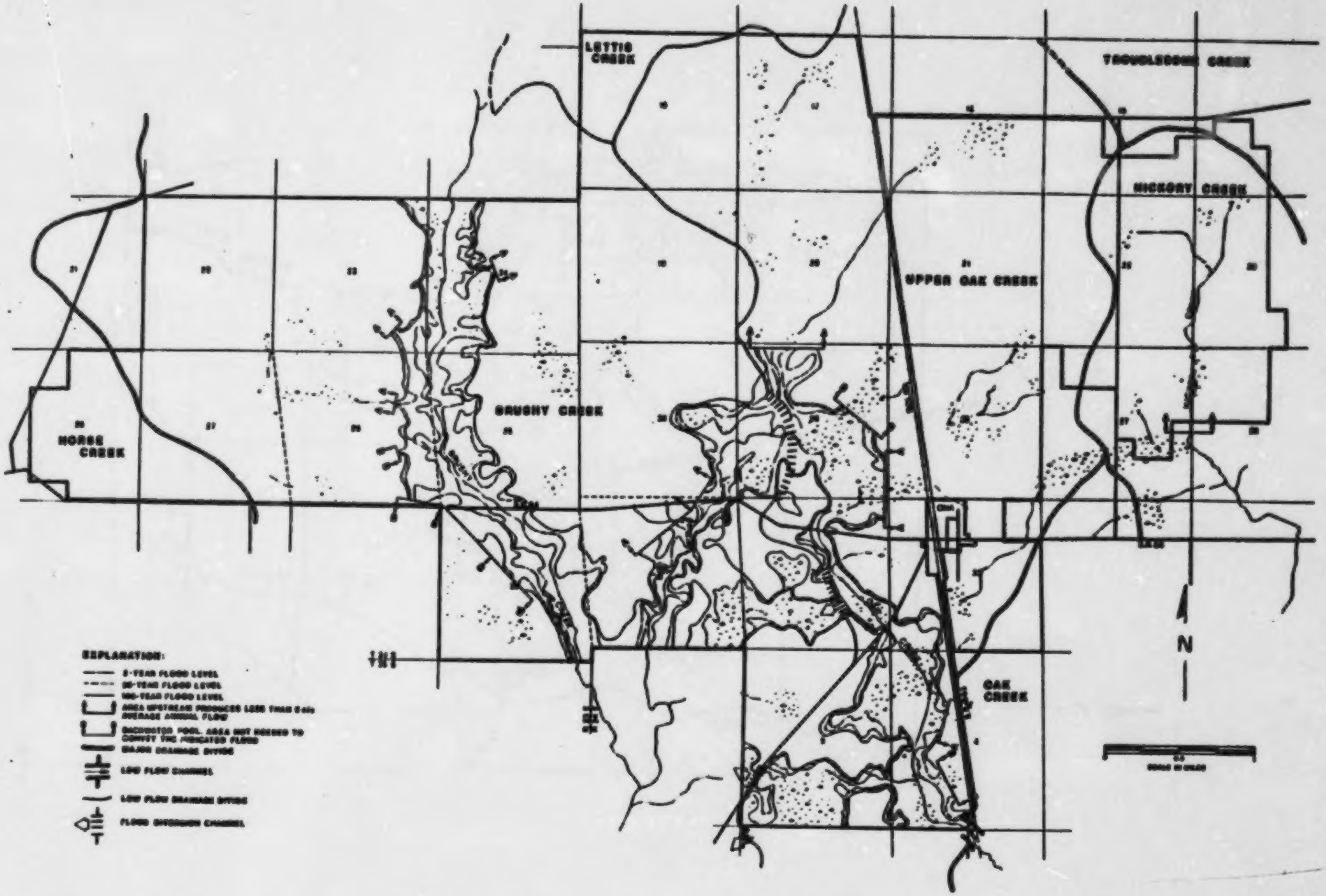

N
MISSISSIPPI CHEMICAL
CORPORATION
PROPERTY SITE
HILLSBOROUGH CO
POLK COUNTY
HORSE CREEK
BRUSHY CREEK
LETTIS CREEK
TROUBLESOME CREEK
PEACE RIVER
WAUCHULA
ZOLFO SPRINGS
HICKORY CREEK
OAK CREEK
BRUSHY CREEK
HORSE CREEK
PEACE RIVER
MANATEE COUNTY
DE SOTO COUNTY

Source: MCC, 1977.

Figure 3.2-2. Surface Drainage Pattern from the Hardee County Mine Site to Horse Creek and the Peace River.


LETTIE CREEK
TROUBLESOME CREEK
HICKORY CREEK
UPPER OAK CREEK
BRUSHY CREEK
HORSE CREEK
OAK CREEK
N
EXPLANATION:
2-YEAR FLOOD LEVEL
25-YEAR FLOOD LEVEL
100-YEAR FLOOD LEVEL
AREA UPSTREAM PRODUCES LESS THAN 2 cfs AVERAGE ANNUAL FLOW
BACKWATER POOL, AREA NOT NEEDED TO CONVEY THE INDICATED FLOOD
MAJOR DRAINAGE DIVIDE
LOW FLOW CHANNEL
LOW FLOW DRAINAGE DIVIDE
FLOOD DIVERSION CHANNEL

SOURCE: MCC, 1977.

Figure 3.2-3. The 2-Year, 25 Year and 100-Year Flood Boundaries of Oak and Brushy Creeks.

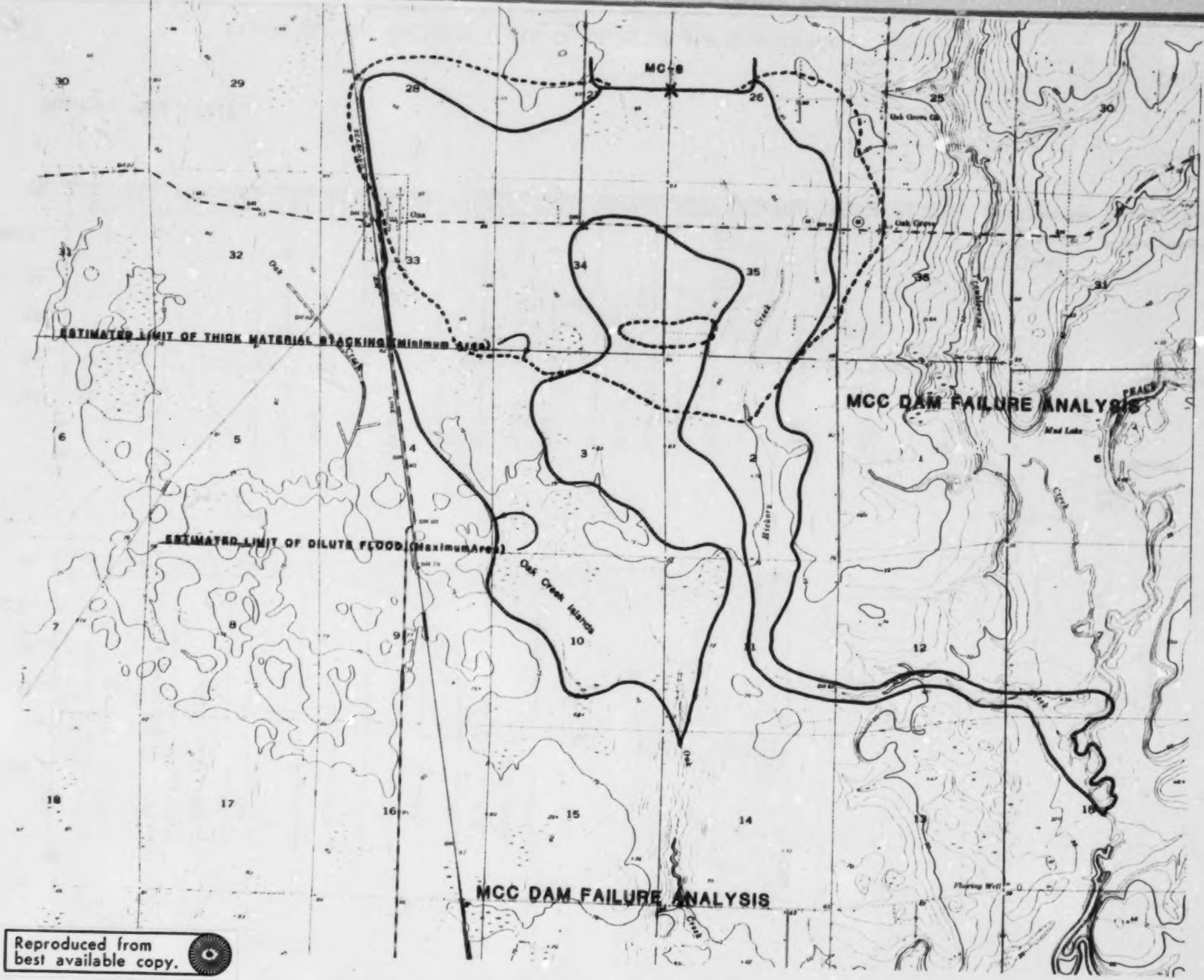

N
MC-8
MCC DAM FAILURE ANALYSIS
ESTIMATED LIMIT OF THICK MATERIAL STACKING (Minimum Area)
ESTIMATED LIMIT OF DILUTE FLOOD (Maximum Area)
Oak Creek Islands
Hickory Creek
Oak Creek
Oak Grove
Mud Lake
Flowing Well
30
29
28
27
26
25
30
31
32
33
34
35
36
31
6
5
4
3
2
1
6
7
8
9
10
11
12
18
17
16
15
14
13
18

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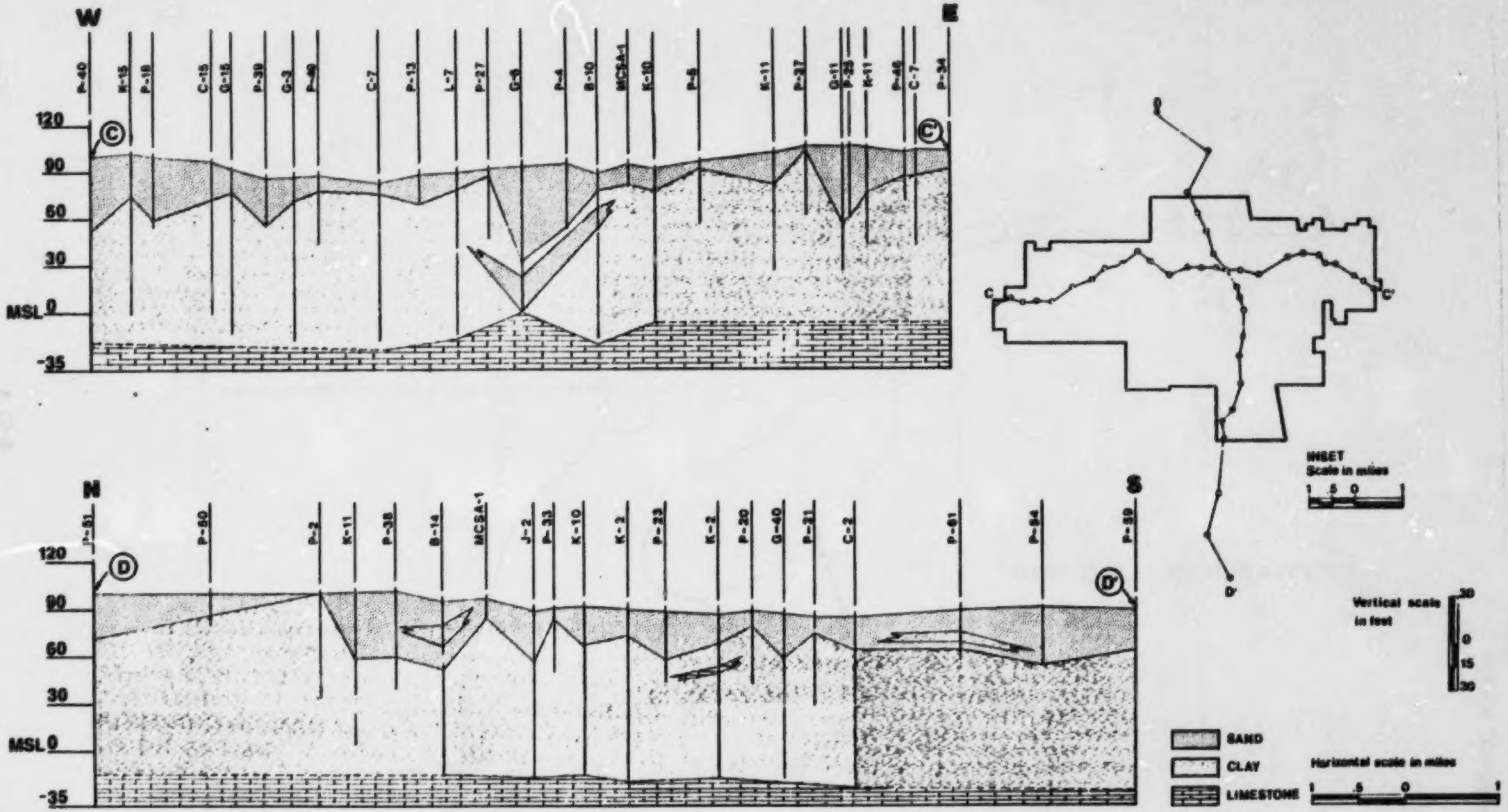
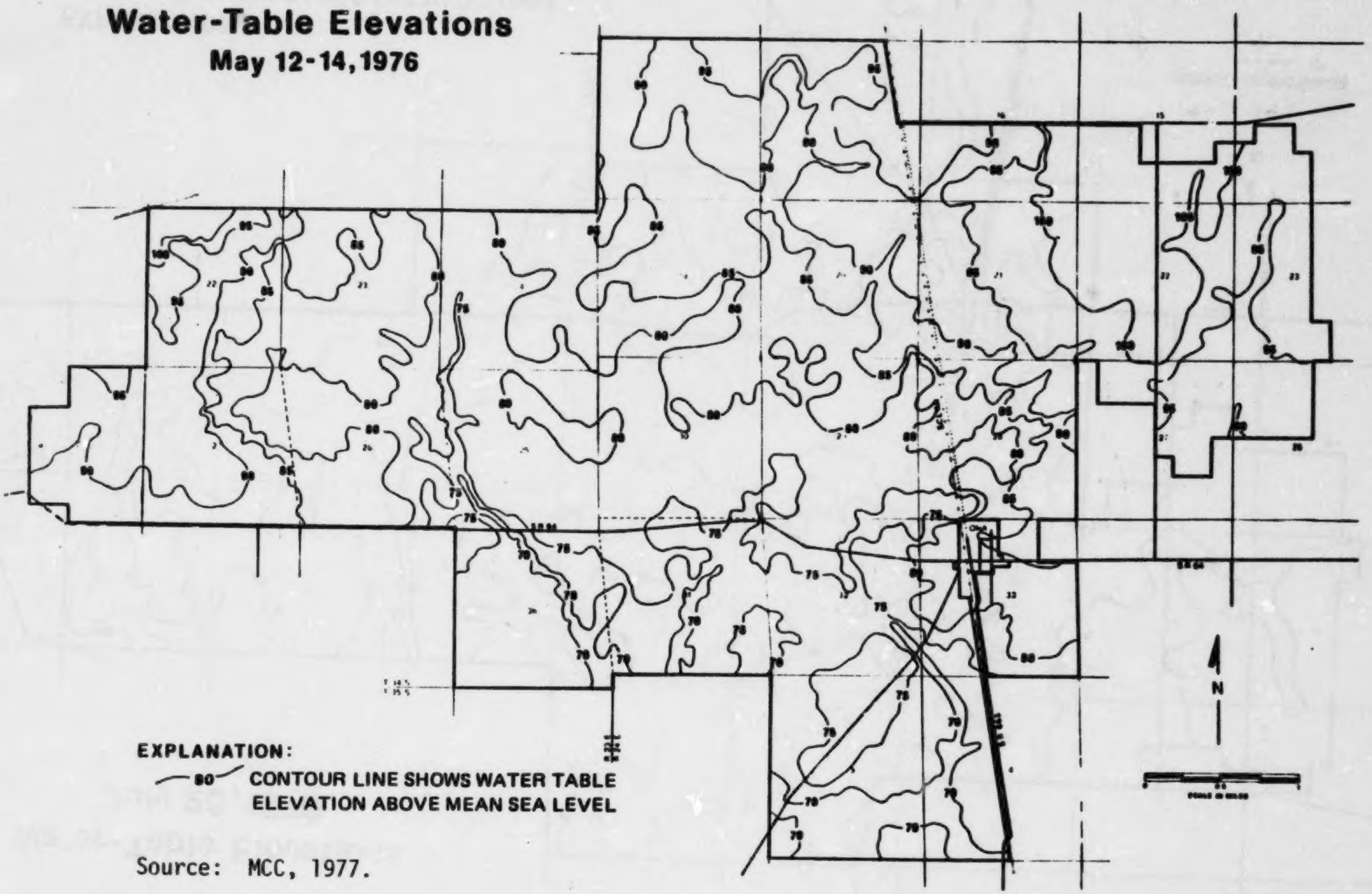
Figure 3.2-4. Extent of Potential Slime Waste Flood from Dam Failure.


W
E
P-40
K-15
P-18
C-15
G-15
P-30
G-3
P-40
C-7
P-13
L-7
P-27
G-6
P-4
B-10
MCSA-1
K-10
P-5
K-11
P-37
G-11
P-35
K-11
P-46
C-7
P-34
C
C'
120
90
60
30
MSL 0
-35
N
S
P-51
P-50
P-2
K-11
P-38
B-14
MCSA-1
J-2
P-33
K-10
K-2
P-23
K-2
P-20
G-40
P-21
C-2
P-61
P-84
P-59
D
D'
INSET
Scale in miles
1 .5 0
Vertical scale in feet
30
0
15
30
SAND
CLAY
LIMESTONE
Horizontal scale in miles
1 .5 0 1

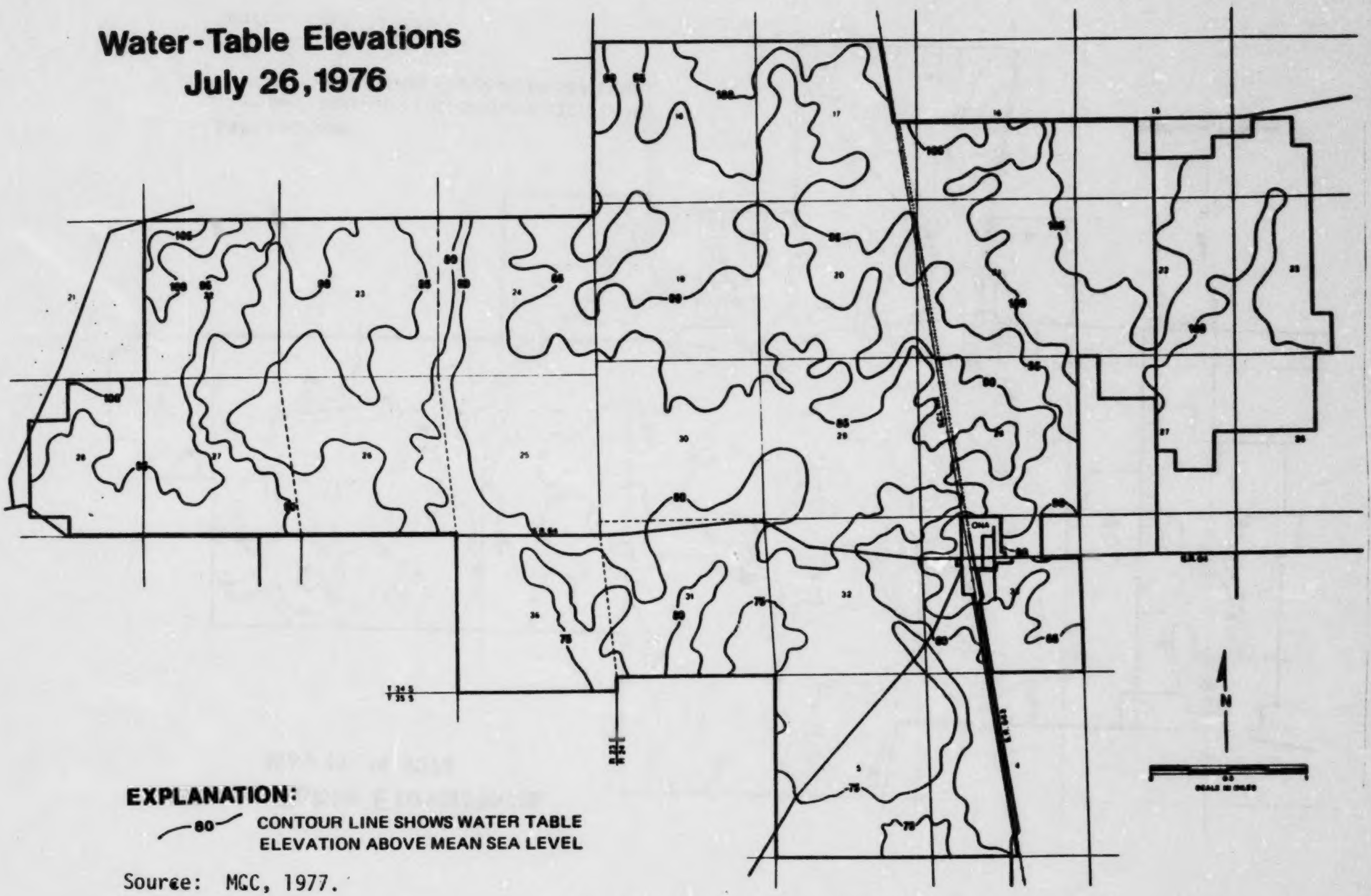
Source: MCC, 1977.

Figure 3.2-5. Geologic Cross Sections of the Near-Surface Geology.


Water-Table Elevations
May 12-14, 1976
EXPLANATION:
80
CONTOUR LINE SHOWS WATER TABLE ELEVATION ABOVE MEAN SEA LEVEL
N
70
75
80
85
90
100

Source: MCC, 1977.

Figure 3.2-6. Water-Table Elevations, May 12-14, 1976.



ONA
N
100
95
90
85
80
75

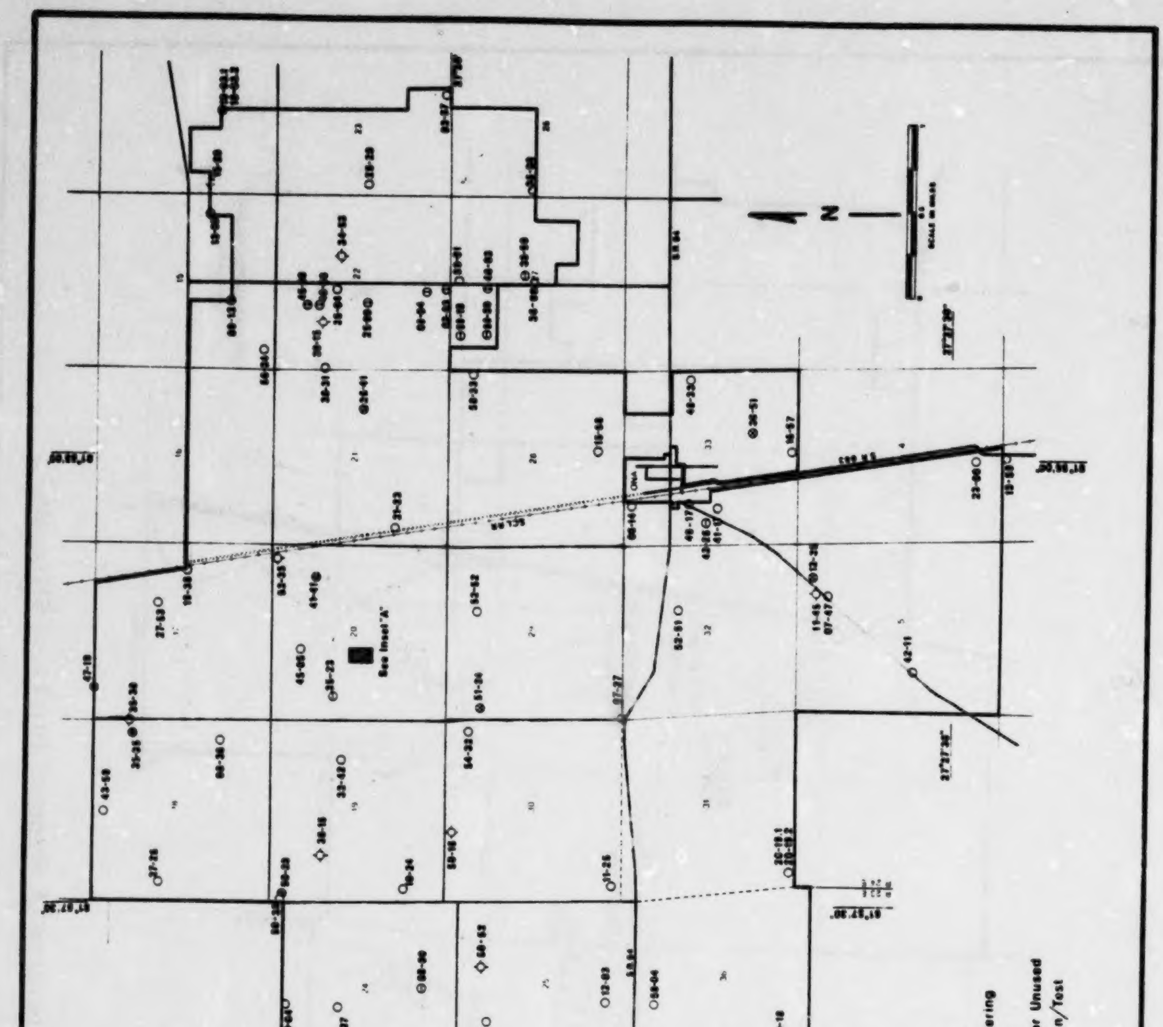
Water-Table Elevations
July 26,1976

EXPLANATION:

80 CONTOUR LINE SHOWS WATER TABLE ELEVATION ABOVE MEAN SEA LEVEL

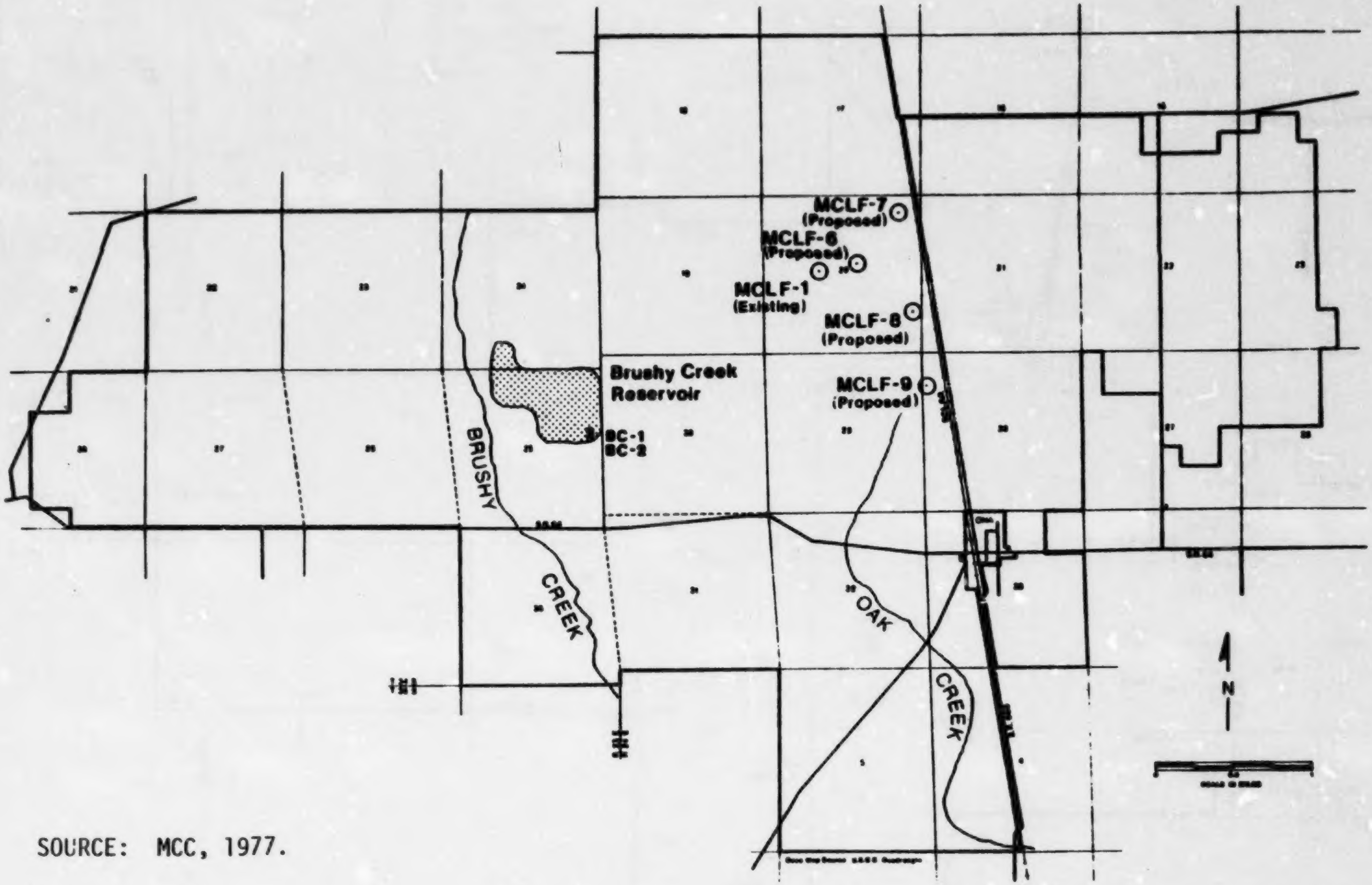
Source: MGC, 1977.

Figure 3.2-7. Water-Table Elevations, July 26, 1976.


Explanation:
Irrigation
Stock Watering
Domestic
Unknown or Unused
Observation/Test
Inset "A"
Inset "B"
See Inset "A"
See Inset "B"
Scale in feet
N
See Inset "A"

SOURCE: MCC, 1977.

Figure 3.2-8. Existing Wells on Property.


MCLF-7
(Proposed)
MCLF-6
(Proposed)
MCLF-1
(Existing)
MCLF-8
(Proposed)
MCLF-9
(Proposed)
Brushy Creek
Reservoir
BC-1
BC-2
BRUSHY
CREEK
OAK
CREEK
N

SOURCE: MCC, 1977.

Figure 3.2-9. Location of Proposed Points of Withdrawal.

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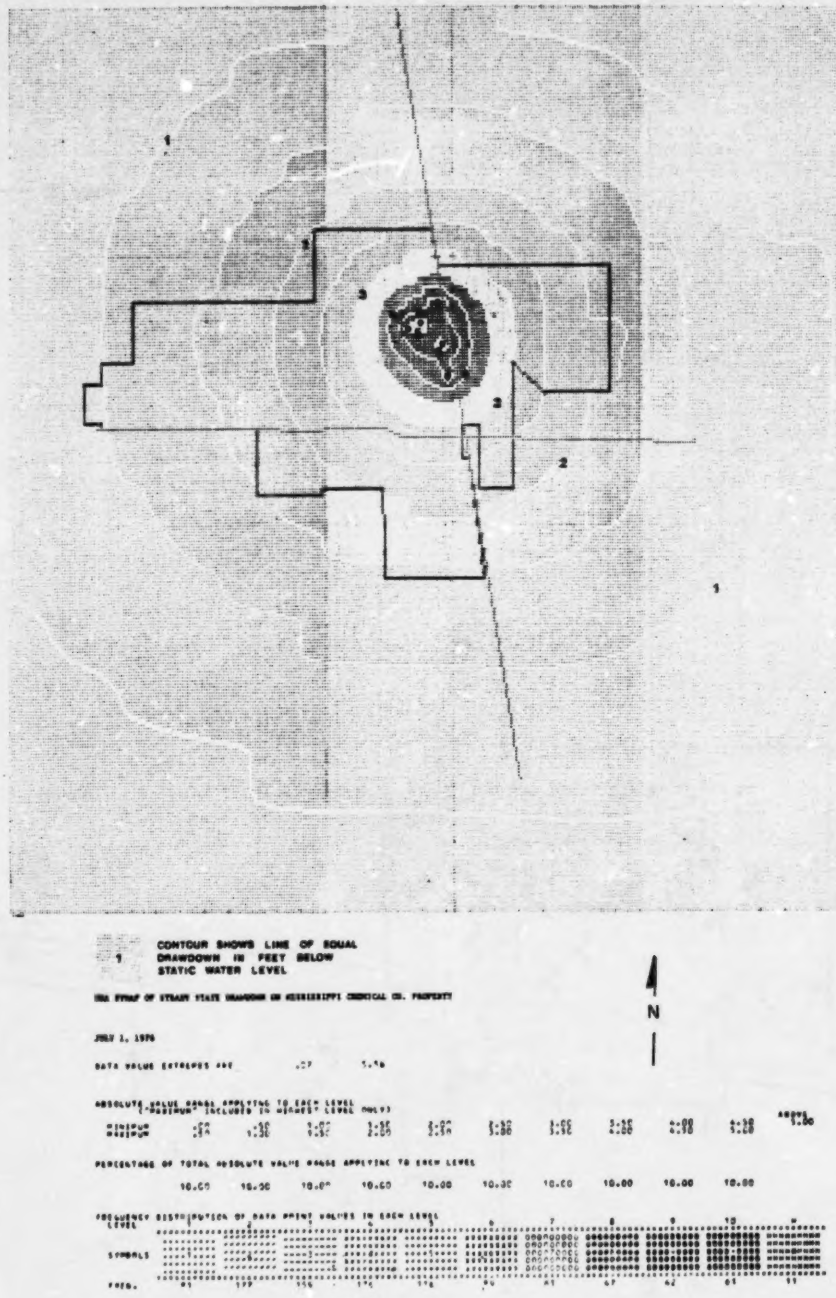
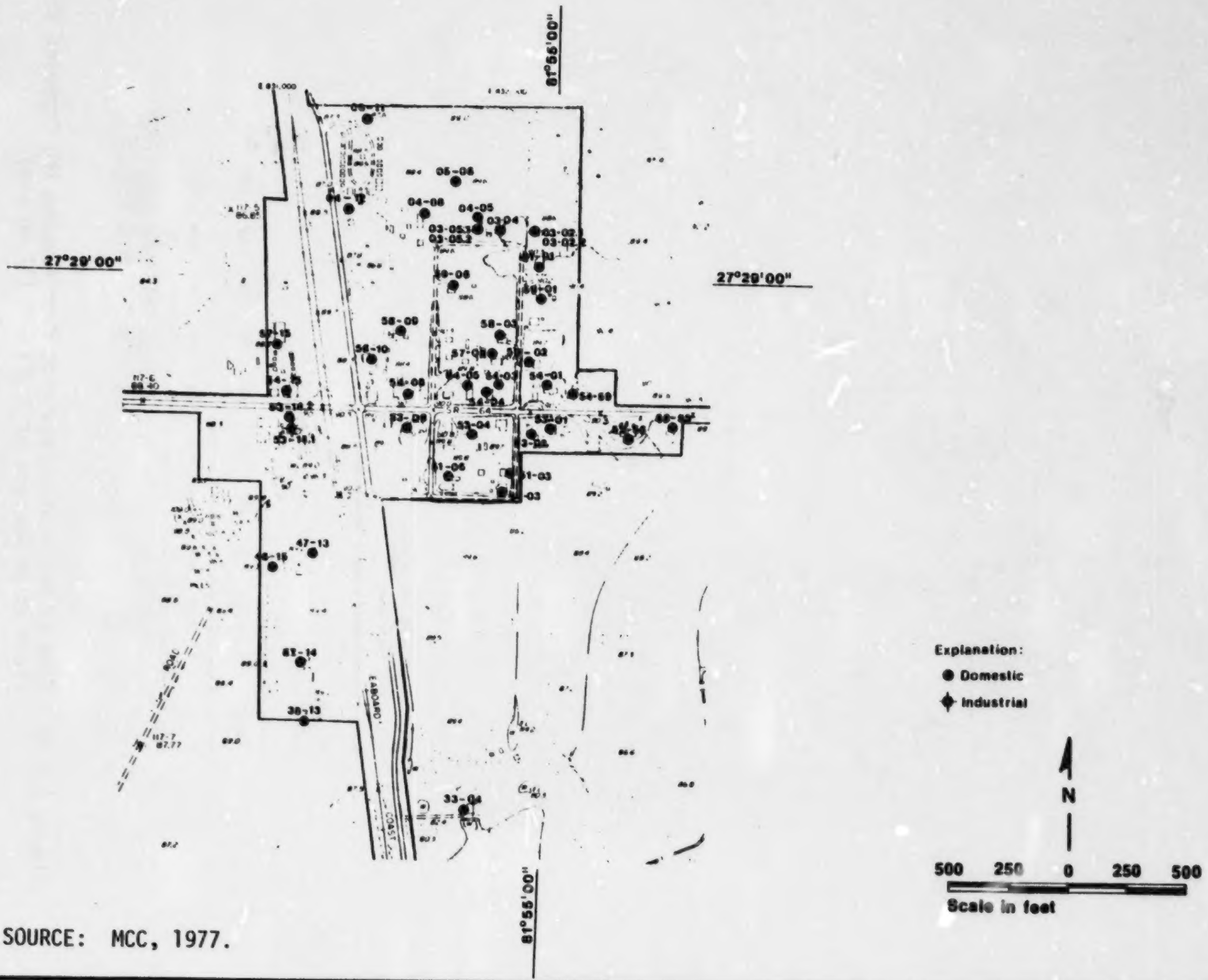

1
2
3
2
2
1
CONTOUR SHOWS LINE OF EQUAL DRAWDOWN IN FEET BELOW STATIC WATER LEVEL
N
DATA VALUE EXTREMES ARE
ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
MINIMUM
MAXIMUM
PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL
LEVEL
SYMBOLS
FREQ.

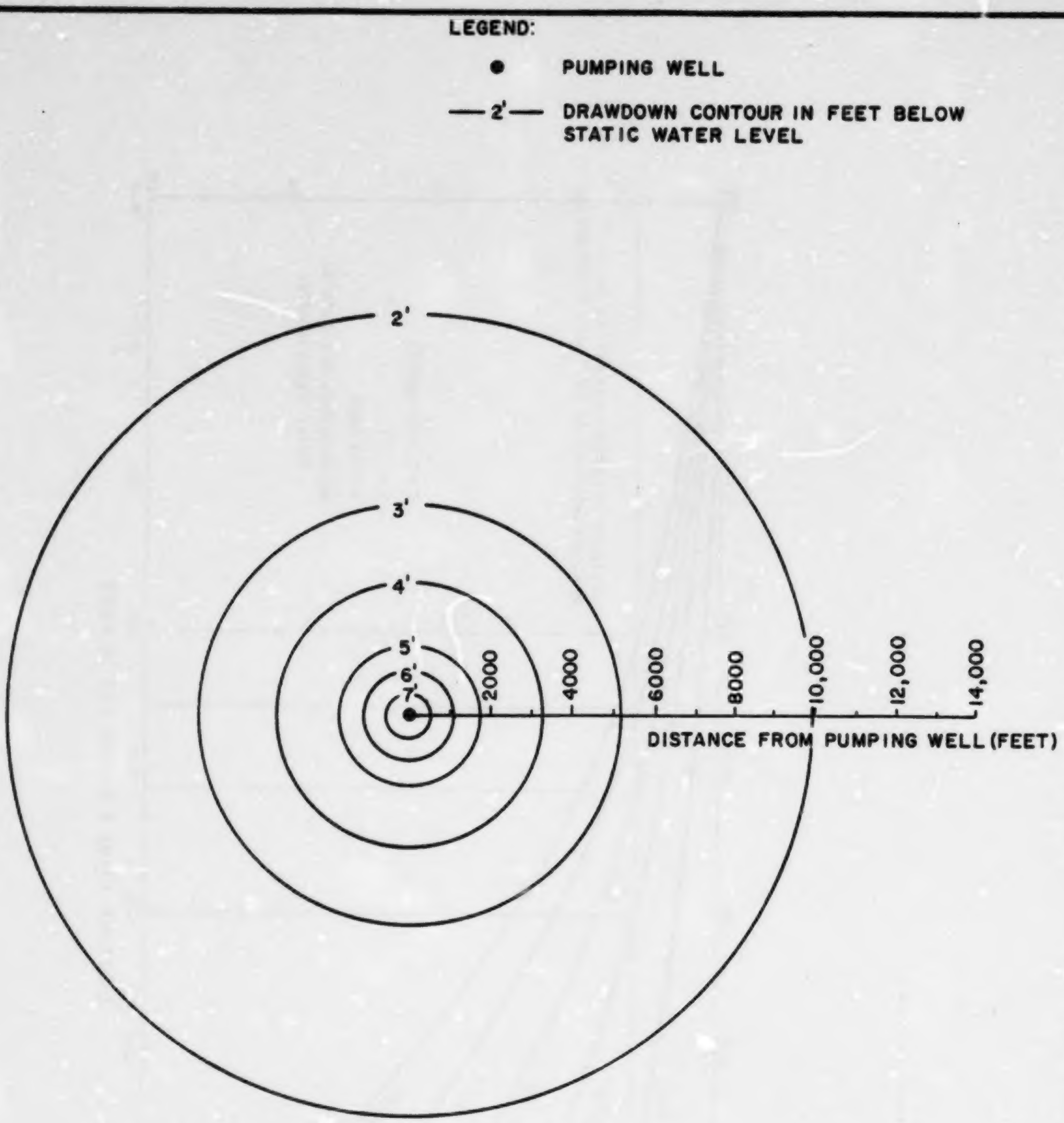
Figure 3.2-10. Cone of Depression Resulting from Pumping the Proposed Well Field at an Average of 7,974 GPM (11.48 mgd)

SOURCE: MCC, 1977.


81°55'00"
27°29'00"
27°29'00"
81°55'00"
06-11
05-08
04-08
04-05
03-04
03-05.3
03-05.2
03-02.1
03-02.2
58-09
58-03
56-10
57-02
54-08
54-05
54-03
54-01
54-04
54-69
53-09
53-04
53-01
53-02
51-06
51-03
53-16.2
53-16.1
57-15
54-15
47-13
46-15
37-14
38-13
33-04
SR 64
SEABOARD COAST
Explanation:
● Domestic
◆ Industrial
N
500 250 0 250 500
Scale in feet

SOURCE: MCC, 1977.

Figure 3.2-11. Existing Well Locations in Ona, Florida.


LEGEND:
● PUMPING WELL
—2'— DRAWDOWN CONTOUR IN FEET BELOW STATIC WATER LEVEL
2'
3'
4'
5'
6'
7'
2000
4000
6000
8000
10,000
12,000
14,000
DISTANCE FROM PUMPING WELL (FEET)

ISOTROPIC DRAWDOWN CONTOURS CALCULATED WITH:

TRANSMISSIVITY = 65,000 GPD/FT

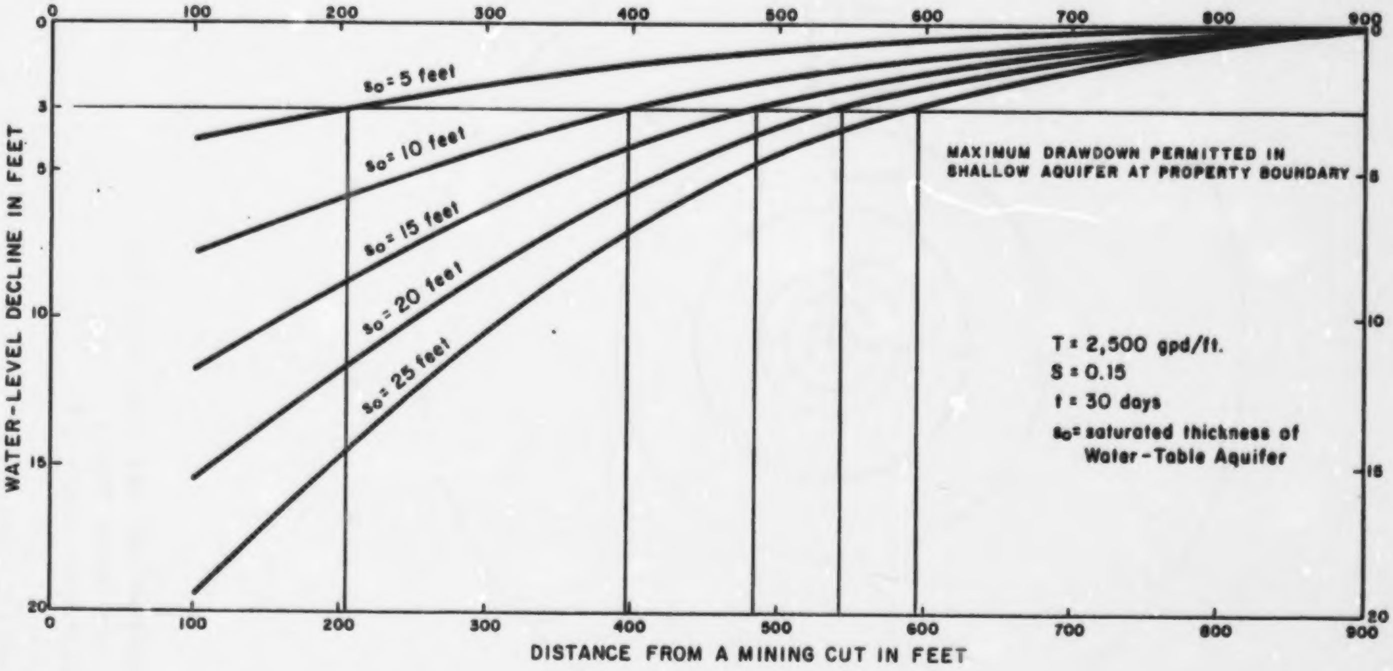
STORAGE COEFFICIENT = 1.66×10^{-2}

LEAKANCE = 0

PUMPING RATE = 500 GPM

PUMPING PERIOD = 2 YEARS

Figure 3.2-12. Projected Cone of Depression Resulting from Sealing Water Withdrawals From the Upper Floridan Aquifer.



SOURCE: MCC, 1977.

Figure 3.2-13. Water Level Declines with Distance from a Mining Cut as Related to Thickness of the Shallow Water-Table Aquifer.

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3.3 BIOLOGY

The following sections discuss the biological characteristics of the MCC site, including upland communities (80 percent of total area) and wetland communities (20 percent of total area). In addition, several miles of intermittent streams cross the property; these are discussed in the sections on wetlands. The major biological communities in the study area are illustrated on Figure 3.3-1. The areal extent of each is listed in Table 3.3-1.

3.3.1 Terrestrial Biology

3.3.1.1 Existing Conditions

Overview

Five vegetation types or terrestrial communities have been identified in the MCC study area. Three are natural upland communities: xeric hammock, mesic hammock, and rangeland. Two other habitats on the site are characteristic of societal activities: agricultural, including one citrus grove and extensive pastureland; and ruderal, comprising fencerows, ditches, and roadsides. The MCC site contains predominantly pasture/ rangeland habitat interspersed with relatively undisturbed, vegetated areas which provide habitats for a variety of vertebrate species. The literature indicates that 301 vertebrate species (37 mammal, 189 bird, 51 reptile, and 24 amphibian) have ranges and habitat requirements which may occur on various portions of the MCC property. Field surveys were conducted in April and August 1980 for vegetation and in April and October 1980 for vertebrate species. Detailed information concerning the methodologies and results of the field efforts are presented in TSD-II.

Site Habitats

Xeric Hammock - Xeric hammocks within the project boundary occupy only about 30 acres, which is less than 1 percent of the total area. Major factors which contribute to the xeric nature of this community include: well-drained soils containing little organic material rate; high evaporation; and water uptake by tree roots (MCC, 1977). Small live oak are abundant in the xeric hammocks on the project site, while longleaf pine and sand live oak comprise a less frequent component of the overstory in this dry habitat. Spanish moss, several bromeliads, and other epiphytes are found on the trees in the overstory. The understory is widely scattered and is composed primarily of turkey oak, sand live oak, and live oak. Saw palmetto occurs in patches and covers about 50 percent of the ground surface, the remainder being only sparsely vegetated. Occasional ground cover species include paspalum, wiregrass, and crabgrass.

Wildlife must be adapted to high temperatures and droughtlike conditions to utilize xeric hammocks. Numerous species feed in these communities, but relatively few are considered residents. Typical vertebrates associated with xeric hammocks include armadillo, gopher tortoise, southern fence lizard, Florida scrub jay, and ground skink. Many bird species nest in the xeric hammocks and feed in the nearby communities; blue jays mocking birds, mourning doves, and several species of woodpeckers feed extensively within the xeric hammock itself. Gopher tortoise burrows are common and are used by a variety of commensal species, including the Florida mouse.

Mesic Hammock - Mesic hammocks occur in areas of intermediate soil moisture and occupy more than 770 acres (5 percent of the site). They are richer in organic matter and have a greater water-holding capacity than xeric hammocks. Mesic hammocks often provide ecotones or buffer zones between the wetlands and the agricultural uplands. This vegetation type is most extensive along the Brushy Creek floodplain.

The mesic hammocks on the site are characterized by a dominant overstory of live oak, with laurel oak and slash pine as overstory subdominants. Understory dominants include wax myrtle, live oak, water oak, myrtle-leaved holly, tallowwood, muscadine grape, peppervine, and sabal palm. The ground cover is often sparse and is usually dominated by Bahia grass, saw palmetto, or wiregrass. Other plants include American beautyberry, creeping charlie, tickseed, and zephyr lily.

As a whole, mesic hammocks can support a large assortment of upland wildlife species due to the broad range of moisture conditions and management practices to which the habitat is subjected. These areas are inhabited by a variety of small mammals, snakes, and toads. The threatened gopher tortoise and eastern indigo snake are often relatively abundant in these areas. Mesic hammocks which are not well drained support rabbits, feral hogs, various tree frogs, chorus frogs, and raccoons in addition to the species occurring in the drier mesic hammocks. Tree-dwelling birds are more prevalent in mesic hammocks than in other upland communities, with bluejays, cardinals, mockingbirds, eastern bluebirds, flycatchers, and woodpeckers being the most common species. Herons and cranes are common along canal and creek banks.

Palmetto Rangeland/Pine Flatwoods - Pines have been extensively timbered throughout much of the area, and much of the natural or planted regrowth is harvested prior to full maturity to provide fencepost material. This practice leaves large, relatively treeless tracts that serve as rangeland.

Palmetto rangeland has abundant ground cover consisting of saw palmetto interspersed with low grasses and shrubs. The overstory is not well developed, although longleaf pines are present in some areas. Palmetto rangeland and the occasional pine flatwoods comprise approximately 6,000 acres (40 percent) of the total site.

The palmetto understory provides abundant cover and nesting sites but is low in forage value. Ground-dwelling species associated with this habitat are often wide ranging and include such species as rattlesnake, armadillo, southern fence lizard, and Florida box turtle. Prairie species are characteristic of the avian community and include Florida bobwhite quail, rufous-sided towhee, and eastern meadowlark. In areas where numerous pines are present, trees provide feeding and nesting areas for gray squirrels, Sherman's fox squirrels, chickadees, tufted titmice, and a variety of insect-eating birds, particularly woodpeckers. The majority of this habitat on the MCC site has been disturbed by active cattle grazing operations.

Agricultural Lands - Agricultural land uses on the property include a citrus grove and improved pasture, while ruderal habitats consist of a variety of locally disturbed areas. A single citrus grove occupies 28 acres, or less than 1 percent, of the total property acreage. Improved pasture occupies 5,040 acres, or 34 percent, of the total property acreage.

Important pasture grasses are Bermuda grass, Bahia grass, and crabgrass. Locally disturbed, ruderal areas such as roadsides, ditches, and fencerows contain numerous weedy plants, including species such as those found in the agricultural lands as well as such species as softrush or pennywort which are adapted to growing in wet ditches. This habitat is also actively grazed by cattle.

Wildlife species are confined primarily to such herbivores and granivores as the eastern cottontail rabbit, eastern harvest mouse, and ground doves, or to insectivores such as armadillos, cattle egrets, eastern meadowlarks, and loggerhead shrikes. Species such as hawks, whitetail deer, and feral pigs use the open areas created by pastures as feeding grounds.

Summary

The upland communities on the MCC site are predominantly palmetto, pasture, and pine flatwoods habitats, comprising almost 75 percent of the total study area. These communities are man-dominated, having been drained or irrigated, as required, for agricultural use. They are actively utilized as open rangeland for cattle. The mesic and xeric hammocks represent the only natural areas of biologically diverse uplands on the site, but these hammocks are small and isolated, offering minimal wildlife habitat.

3.3.1.2 Environmental Impacts

MCC's Proposed Action

Approximately 8,182 acres of upland habitats on the MCC property would be directly affected by the clearing or covering of vegetation during the course of mining operations and plant construction (Table 3.3-1). Approximately 94 percent of the disturbed lands are pasture, citrus crops, and palmetto range/pine flatwoods. Since mining activities would disturb land in selective blocks at any one time, much of the site would remain in a natural state for several years after mining was initiated.

The most apparent adverse effect of mining and reclamation would be a loss of the few natural upland habitats which are present on the site. Mesic hammocks and xeric hammocks would probably be permanently eliminated where the soil was radically altered by mining or clay storage; soil conditions suitable for improved pasture use would be created. If fire were suppressed for long periods in areas of increased human activity on the site, xeric hammocks which are indirectly affected by mining operations would gradually shift to more mesic conditions.

The loss of upland habitats would directly affect the wildlife that use these systems. Although undisturbed areas could provide refuge during mining activities, wildlife habitats on the site are probably at or near their carrying capacities. Animals from newly disturbed areas either would not become permanent residents of undisturbed areas or they would compete with previous residents for the limited food sources and cover available.

During mining, lowering of the ground water table would indirectly affect nearby natural communities which are not to be mined. This effect should be temporary since the water table would be restored to approximate pre-mining levels during reclamation. The impact of dewatering activities is expected to be similar to that of a severe drought. If rainfall were above normal and frequent throughout the growing season, the lowered water table might have little or no effect on the vegetation. If rainfall were subnormal or irregular, vegetative production would be reduced, and some plants might remain dormant for a year or more. Normal growth in the upland communities should resume once normal water table levels are attained.

Short-term dewatering of unmined habitats would also stress the site fauna. Resident wildlife would migrate to areas unaffected by dewatering, increasing population pressures in these areas. Drought-like conditions which extend over two or more years could affect several generations of short-lived animals. Lowered numbers of important prey species would also lower population levels of some predators. However, once the water tables are re-established, most mammal populations would return rapidly to normal densities.

Some of the native upland communities are not scheduled to be mined, but might be affected by mining-related activities such as "walking" of draglines between mine sites, or construction of roads, dams, and plant facilities. Some of these disturbances would be long-term, with no reclamation or other mitigation likely. Effects on biological systems would vary according to the extent of disturbance.

Changes in air quality resulting from mining operations might also affect the terrestrial communities on the MCC site. Dust and other air emissions would increase ambient levels during mining, but the only air pollutant likely to affect the site biota is fluoride. Gaseous fluorides might be generated in minor quantities during mining operations from rock dryers and waste process water ponds (USEPA, 1976). Particulates containing fluorides might settle on vegetation and, if soluble, be transported into plant tissues. Wildlife are most likely to be affected by foraging on foliage containing fluoride particulates, but the rainfall in the region would cleanse the vegetation of particulates at frequent intervals and reduce the potential fluoride toxicity (USEPA, 1978). Analysis of fluoride deposition from proposed MCC activities indicates that no adverse effects should be expected (Section 3.4 and TSD-III). After entering the soil, fluorides would be scarcely, if at all, absorbed by roots. Other emissions, such as SO_2 and radionuclides, would occur at such low levels that impacts on the biota would not be discernible.

Alternatives

Selection of one or more alternatives (Section 2.0) to the proposed plan would generally have similar impacts on upland communities as would the proposed action. The alternatives that would have the most potential to modify impacts on upland systems are:

- The use of a dredge in mining (Section 2.1). This would reduce the severity of dewatering impacts during early phases of mining in specific areas.
- The use of trucks to transport matrix (Section 2.3). This would result in an increase in noise, dust, and exhaust emissions impacts on biota in the study area.
- The elimination of a rock dryer on the site (Section 2.7). This would reduce the potential for air emissions impacts associated with this process, particularly with respect to the effects of fluorides on vegetation.
- The selection of a waste disposal/reclamation alternative (Sections 2.8 and 2.9). Conventional waste disposal with land-and-lakes reclamation would result in fewer acres of uplands and soil conditions unfavorable for mesic or xeric hammocks. Improved pasture would be the only potential habitat to be

recreated. Sand/clay mixing waste disposal would produce soils more suitable for agricultural use, but still unsuited to xeric and mesic hammock habitats.

- The use of trucks in product transport (Section 2.11). This would result in more noise, dust, and emissions impacts on biota in the area.
- For the no action (Section 2.12) or postponement of action (Section 2.13) alternatives: The former would leave upland conditions as they are now. The latter would delay, but not ultimately change, the impacts described for the proposed action.

3.3.1.3 Mitigative Measures

Almost all of the upland habitats which would be affected by the proposed mining and clay storage plans are of relatively low ecological value and could be readily replaced during reclamation following mining activities. Therefore, the primary mitigative measures which would be applied are protection of undisturbed habitats or reduction of impacts to important species that might occur in upland areas. Mitigation would include:

- Rapid reseeding of reclaimed areas to reduce erosion and encourage topsoil development,
- Specific plans to reclaim xeric and mesic hammocks.
- Maintenance of vegetated migration routes for animals during both mining and reclamation for enhancement of the distribution of plant and animal species,
- Spraying of roads to reduce fugitive dust,
- Maintenance of retention dikes to preclude accidental waste or slurry spills into terrestrial areas, and
- Training of personnel to avoid disturbance of the gopher tortoise and indigo snake, or relocation of these species to undisturbed areas.

3.3.2 Wetlands and Aquatic Ecosystems

The two ecosystems of most importance on the MCC site from a biological perspective are wetlands (swamps and marshes) and streams. The distribution of these habitats in the study area is illustrated on Figure 3.3-1, and the total acreages of wetlands on the site are listed in Table 3.3-1.

3.3.2.1 Existing Conditions

Wetlands

Wetlands are the most valuable ecological resource on the site because they serve as habitat for biota and also enhance local and downstream water quality. There are presently 2,980 acres of wetlands on the MCC property, or 20 percent of the total site area. Hardwood swamps make up 490 acres, and fresh water marshes represent 2,490 acres of the site wetlands. Floral and faunal characteristics of wetlands on the site are described by habitat types. The information presented in this section was derived from a review of the literature and from field surveys conducted in April and August 1980 for vegetation and in April and October 1980 for animals. More detailed information on sampling methodologies and results is presented in TSD-II.

Hardwood Swamps

Hardwood swamps on the site, corresponding to the swamp range designation of the U.S. Department of Agriculture (1958), comprise 490 acres, or about 3 percent, of the project area. These swamps vary from small, isolated stands of 3 acres to one of 98 acres. Several are either mixed hardwood swamps, dominated by deciduous trees, or bayheads which are dominated by species of evergreen bay.

Overstory composition of the swamps on the site is variable, but generally the wettest portions of the swamps are dominated by blackgum, with red maple, swamp ash, and sweetbay occurring as subdominants. The slightly drier edges of the swamps are characterized predominantly by slash pine, pond pine, sweetgum, and American elm. The understory vegetation consists primarily of sweetbay, wax myrtle, red maple, buttonbush, and blackgum; shrubby growth is least abundant in the central portions of the swamps where inundation is most frequent. The forest floor is characterized by depressions interspersed with raised hummocks of roots and vegetative debris. The more mesic herbaceous species occupy the drier hammocks, and muck/peat soils support hydrophytic emergent species within the hollows. Completely inundated areas support emergent and free-floating hydrophytes.

Hardwood swamps provide a greater habitat diversity than any other community type on the site. Amphibians and reptiles dominate the lower strata. Amphibians are represented by tree frogs, southern leopard frogs, and dwarf salamanders. These species in turn are preyed on by carnivores such as the eastern mud snake, Florida water snake, and the cottonmouth water moccasin. Numerous small fish, such as mosquitofish and mollies also occur in standing water bodies in the swamps. The large deciduous trees in the swamps are used as nesting and feeding habitats by a variety of birds such as flycatchers, wrens, thrushes, vireos, warblers, and owls. Dry edges of swamps provide habitat for raccoons, skunks, rabbits, other small mammals, and whitetail deer.

Marshes

Marshes occupy 2,490 acres or 17 percent of the MCC property. They vary from isolated, shallow, temporary ponds to semi-permanent water bodies closely contiguous with the native streams.

Four zonal communities have been observed in the marshes. A peripheral marsh zone remains saturated to moist through much of the year but is seldom flooded. This zone is dominated by shrubby vegetation and live oak or, where overstory and understory vegetation are less dense, by water pennywort, blue flag, and sedges. A second zone occurs in areas where the soil is saturated or submerged to a depth of about 10 cm and is dominated by sand cordgrass or softrush, with arrowhead, and false pimpernel as subdominants. A third marsh zone occurs in areas characterized by 10 to 30 cm of standing water. Clumps of sand cordgrass are the most evident constituent, but species from the second and fourth zones are also common. The fourth marsh zone occurs in submerged areas characterized by about 30 to over 60 cm of standing water. This portion of the marsh is dominated by an association of maidencane and pickerelweed, although arrowroot is common. Species of floating vegetation such as duckweed and floating hearts also occur; submerged aquatic vegetation consists of bladderwort and spike rush.

Many of the small, shallow marshes on the site are typified by wet prairie vegetation and do not provide the abundance of food and hiding places of larger areas; therefore, wildlife usage of many of the small, seasonal marshes is sporadic. These areas are occasionally used for feeding and nesting by a variety of shorebirds, such as the greater yellowlegs, common gallinule, and white ibis. Rice rats and cottontail rabbits are also common. These small marshes also provide feeding and nesting habitats for the Florida sandhill crane. A number of amphibians and fish use the marshes that are commonly inundated and, during high water, other aquatic vertebrates migrate into these areas from adjacent streams.

Aquatic Ecosystems

The MCC site is drained by six small, tannin-stained (dark) streams which flow generally in a north-south direction and eventually empty into the Peace River (Figure 3.2-2). In addition to the natural stream courses and their tributaries, much of the property is also crossed by man-made channels. This channelization has served to adapt the site for agricultural and cattle use either by draining excess water from the property or by irrigating, depending on seasonal fluctuations in rainfall.

Brushy and Oak Creeks are considered to be the most important aquatic habitats on the site and are the only streams on the property which have mean annual flows greater than 5 cfs (Figure 3.3-2). Flow in these streams is usually very sluggish except during periods following heavy rainfall. The wet season (May through September) creates numerous areas of standing water throughout the site property. In the dry season, many of the water bodies are dry for several months, and most streams become intermittent.

Six sampling stations were established to provide an assessment of characteristic aquatic habitats in Brushy and Oak Creeks. A sampling program was conducted during April 1980 for all aquatic communities, and a subsequent effort was undertaken in August 1980 for fish only. A summary of the biological data collected during these survey periods is presented in the following sections. More detailed information on the aquatic communities of the MCC site is provided in TSD-II.

Phytoplankton - Phytoplankton are small, photoautotrophic algae that move with the water currents. Phytoplankton densities were high at all of the stations sampled, with green algae and diatoms the most abundant groups collected. The diatoms were represented by such species as Cyclotella, Melosira, Navicula, Nitzschia, and Pinnularia. Among the the most common green algae were species of Chlorella, Oedogonium, Scenedesmus, and Volvox.

Aquatic Macrophytes - The term "macrophyte" is used to define the vascular hydrophytes and the larger attached algae which are part of the periphyton. The major "forms" of macrophytes found in this study were classified as emergent, floating-leaved, free-floating, and submergent.

The distribution of macrophytes in Brushy and Oak Creeks appeared to be restricted primarily to areas where there was little canopy. Where fresh water marshes were contiguous to streams, macrophytic vegetation common to the marsh community was abundant along the stream edges. Twenty species of aquatic macrophytes and shoreline vegetation were associated with streams on the MCC site. Water hyacinth occurred in great abundance in Oak Creek, reducing the quality and diversity of this stream in comparison with Brushy Creek. Other species which were common in Brushy and Oak Creeks were alligator weed, marsh purslane, parrot's-feather, and pickerel weed.

Zooplankton - Zooplankton are small, aquatic animals that cannot move against a current and, therefore, depend primarily upon water flow for their distribution. Most zooplankton are filter feeders, removing particulate matter from the water. The zooplankton are a crucial link in the food web between phytoplankton and most other consumers.

The zooplankton species enumerated from samples on Brushy and Oak Creeks were copepods, rotifers, and cladocerans. Rotifers and copepods comprised approximately 96 percent of the total zooplankton community identified from both creeks even though they were present in low numbers. Although cladocerans were observed in all samples, they were never a major segment of the zooplankton community. Among the rotifers which were most frequently collected during the present investigation were: *Euchlanis*, *Lecane luna*, *Monostyla bulla*, *Platyias*, *Polyarthra*, and *Testudinella*. *Alona guttata* was the only cladoceran species which was identified in all of the samples.

Benthic Macroinvertebrates - Benthic macroinvertebrates are bottom dwelling organisms which live all or part of their life cycle in or upon various underwater substrates. These organisms are important in aquatic ecosystems because of the diverse trophic levels they occupy. They also represent an important food source for fish and include species of commercial and recreational importance.

Forty-eight genera of benthic invertebrates representing 22 families were identified in samples collected from Brushy and Oak Creeks. The density of the benthic organisms collected ranged from 1,614/m^2 to 8,137/m^2. The dominant benthic organisms in both creeks were oligochaetes, or segmented worms, which comprised approximately 57 percent of the benthos enumerated. The only other taxonomic groups of benthic organisms having average densities which exceeded 10 percent of the benthos from all sampling locations were: midge flies, 17 percent at Brushy Creek and 15 percent at Oak Creek; and fingernail clams, 29 percent at Oak Creek.

Most of the oligochaetes collected in samples from Brushy and Oak Creeks were species of *Limnodrilus* and immature tubificids. Species of *Polypedilum* and *Tanytarsus* were the most common midges taken from Brushy and Oak Creeks. *Chironomus* was also very abundant in Oak Creek, representing 29 percent of the midges enumerated. *Chironomus* was also collected from Brushy Creek, but in much lower densities. Fingernail clams were collected at all sampling stations but were more abundant in Oak Creek than in Brushy Creek.

Fish - Fish are often the most visible and important aquatic organisms from a recreational and aesthetic point of view. Fish are the main vehicle for transforming energy of the aquatic ecosystem into a form available for human use through recreational fishing. In addition, smaller species of fish, although not directly utilized by man, harvest the plankton and benthic organisms of the area and, in turn, become food sources for larger fish that are directly utilized by man.

Twenty-nine species of fish (excluding an unidentified immature sunfish) representing 11 families were collected from the sampling stations on the site. All of the species collected are common in the site area (CF Mining Corporation, 1976 and USEPA, 1978).

In Brushy Creek, 26 species of fish in addition to an unidentified, immature sunfish, were collected. These species represented 10 native families, including gar, bowfin, minnows, sucker, catfish, topminnows, livebearers, silversides, sunfish, perches, and one non-native family, walking catfish. In Oak Creek, 19 species of fish were collected. These species represented eight families, including the gars, bowfin, suckers, catfish, topminnows, silversides, sunfish, perches, and walking catfish. The mosquitofish and the least killifish were the most abundant species collected from Oak and Brushy Creeks.

Summary

The majority of the wetlands on the MCC property are relatively small, isolated systems which are infrequently contiguous to other water bodies (Figure 3.3-1). The few large wetlands on the property are valuable primarily as diverse habitat for wildlife, particularly when considered together with adjacent, non-wetland systems, such as mesic forests. Some of these systems afford important refuges for wildlife and can be used temporarily by species displaced during mining activities. These areas would also provide important plant and animal seed sources during reclamation efforts. The majority of the study area, however, has been highly disturbed by societal activities, such as drainage or irrigation canals and channelization of streams. In addition, although both Brushy and Oak Creeks afford habitat for many aquatic species, man-made modifications in these streams, highly fluctuating water levels, and the high organic loading from macrophytes in these water bodies, particularly in Oak Creek, have resulted in reduced water quality and habitat value.

3.3.2.2 Environmental Impacts

MCC's Proposed Action

Wetlands - The proposed mining and clay storage plan would directly affect 2,540 acres of existing fresh water swamps and marshes (Table 3.3-1) and approximately 4 miles of 5 cfs stream beds (Table 3.3-2). Based on the criteria developed in the Central Florida Phosphate Industry Areawide Impact Statement (USEPA, 1978), the loss of some of these land/water interface systems could result in significant declines in biota, changes in hydrology, and/or deterioration of water quality. The diverse fauna, particularly birds, which use the site would be reduced in number, and migrants which attempted to return to undisturbed habitats would stress those communities which were near carrying capacity. This would result in a general decrease in animal population density throughout the site. Most of these impacts, however, should be reversible. Successful reclamation and wetlands management would allow recovery of these populations as species from undisturbed habitats migrate into newly developing, unoccupied niches suitable for their reproduction.

Indirect effects of mining activities would produce additional stresses upon the site's plant and animal communities. The most important indirect impacts would be those associated with pit dewatering, which could lower the water table of adjacent ecosystems not scheduled for mining and simulate conditions of prolonged natural drought. If rainfall were subnormal during the growing season, sensitive vegetation would be stressed, and densities of the animal populations which use the affected wetland habitats would be reduced. However, drought conditions occur naturally about every 20 years without long-term losses of native vegetation or wildlife.

As a result of dewatering, the potential for swamp fires would increase, particularly during periods of low rainfall. Such fires would not have appreciable, long-term effects except where hardwoods were destroyed. The possibility of a widespread fire would be remote since fire would probably not to spread across roads, mining pits, or other clearings.

Soil erosion into wetlands is another indirect impact which could occur as a result of vegetation removal by mining and piling of overburden in steep spoil banks. However, since the mined areas would be below grade, and perimeter dikes would be built around the actively mined areas, most of the runoff should be contained in the mine pits.

Pipelines, transmission lines, roads, and other structures that might be built across wetlands would produce both short and long-term disturbances. However, most wetland communities have the capacity to become re-established in those areas where peaty acid substrates and suitable hydroperiods are maintained.

Aquatic Ecosystems - Approximately 4 miles of streams with greater than 5 cfs mean annual flow, including about 1.3 miles of Brushy Creek and 2.9 miles of Oak Creek, would be mined under the proposed mining plan (Table 3.3-2). Large segments of these habitats have already been significantly modified through channelizing and straightening. The diversion of stream flow into new channels prior to mining of each stream would enable relocation of the majority of fish and mobile benthic forms, but non-mobile benthic forms would be lost. Some loss of fish and benthos would occur due to isolation in stream pockets created after stream flow diversion. The successful recovery of aquatic communities within diverted sections of the streams would depend primarily upon physical characteristics of stream topography, the development of instream vegetation, and colonization of the stream by benthic invertebrates.

Dewatering activities associated with mining would also affect the existing aquatic biota in the streams on the site by lowering the adjacent water table. In areas where extreme reduction of stream volume occurred, the water bodies could become segmented into isolated pools, causing a reduction in population densities. The decreased stream flow would also reduce the transport of benthos and organic materials to downstream systems.

Some suspended solids would be transported in the runoff water to the aquatic habitats on the site. Erosion would result in some short-term effects such as: reduction of light penetration and photosynthesis, smothering of benthic organisms, destruction of spawning areas, and abrasion and clogging of fish gills (Cairns and others, 1972). Although the effects of erosion could be reversed following abatement, all components of the aquatic community could be altered by increased sedimentation (Muncy and others, 1979).

After the forest canopy adjacent to site streams is opened, more sunlight would reach the surface of the streams, resulting in higher temperatures and increased productivity of vegetation. It is unlikely that the slight increase in temperature from increased insolation would adversely affect the species presently occurring in Brushy or Oak Creeks, although high temperatures in isolated pools might stress some species. Additional macrophytic development would provide shelter, substrate, and foraging areas for various aquatic organisms. In areas where excessive macrophytic growth occurred, the death and decompositon of these plants might result in decreases in dissolved oxygen, with concomitant losses of oxygen-sensitive organisms. As trees and other plants begin growing along the stream banks following reclamation activities, most of the changes caused by vegetation removal would be reversed.

The proposed effluent discharge into Oak Creek from the water recirculating system might contain a number of substances such as clay wastes, phosphate, and flotation reagents. The impact of each pollutant would vary, but the most probable impacts would occur due to increased suspended solids, oil and grease, and trace concentrations of amines and other organics used in phosphate beneficiation. Although prolonged discharges could reduce the density and diversity of stream organisms, the expected infrequent discharges primarily during high flow conditions should have only short-term impacts. These wastes would probably enhance populations of the tolerant species now present.

Time-Phased Impacts - The proposed mining, clay storage, and reclamation activities would occur over a period of approximately 44 years. As mining proceeds, many of the mined-out areas would be utilized for clay storage and subsequent reclamation so that ecosystems would vary over the project life. To evaluate these events, a series of overlays was developed for each four-year period during the project life, indicating the areas of wetlands and 5 cfs streams affected by mining, clay storage, and/or reclamation. The results of a tabulation of wetlands status during each of these time periods are shown in Table 3.3-2 and Figure 2.10-8. Approximately 14 percent of all wetlands to be affected by the MCC project would be lost during the first four years as a result of mining and clay storage activities; in addition, 0.25 miles of 5 cfs stream bed in Oak Creek would be lost during this same period. These habitats would be replaced during the later years of the project, with development of wetlands and stream channels in some areas beginning in the early years of mining activity. Other reclamation activities would follow capping of waste disposal areas.

Figure 2.10-8 summarizes the cumulative status of wetlands lost and the development of reclaimed wetlands over the duration of the project.

Alternatives

Most of the alternatives to the proposed action (Section 2.0) would generally result in impacts to wetlands and aquatic communities similar to those anticipated to occur as a result of the proposed action. Alternatives that would modify impacts to these wetlands and aquatic systems include those that are discussed for upland communities (Section 3.3.1.2). In addition, the selection of an alternative wetlands preservation scheme (Section 2.10) that would protect habitats other than, or in addition to, those to be protected by the proposed action would result in additional preservation of habitat (Table 2.10-1). Functional values that can be attributed to each preservation alternative are:

- Strict application of USEPA Areawide Categories (Figure 2.10-2)- Wetlands with relatively low hydrologic or habitat functions would be preserved.
- Site-specific application of USEPA Areawide Categories (Figure 2.10-5) - Wetlands of high habitat function but relatively low hydrological function would be preserved.
- Wetlands Systems Categories (Figure 2.10-6) - Broad preservation of wetlands and mesic (upland) communities which have very high habitat value but relatively low hydrologic function.

3.3.2.3 Mitigative Measures

Wetlands and aquatic systems which would be protected from mining activities would require the application of mitigative measures to preclude loss of ecosystem functions. In addition, reasonable mitigation should be employed to reduce deterioration of other wetlands systems until they were mined or used for waste storage activities. These measures would maximize the number of seed sources available for reclamation activities and reduce the effort required to transport wetland soils and innoculum species from offsite. With the exception of those designed for the protection of xeric species (Section 3.3.1.3), the mitigative measures discussed for upland habitats also apply to wetlands communities. Additional mitigative measures which are planned to be undertaken are as follows:

- Wetlands planned for preservation would be protected by a non-mineable buffer zone averaging approximately 250 feet in width to reduce the effects of noise, dust, erosion, and water drawdown on wetland species.
- During the mining phases where water drawdown could occur, a water-filled rim ditch would be placed adjacent to the protected wetlands to provide a hydraulic gradient and maintain normal ground water levels.
- Along those sections of streams which would be mined, mine cuts would first be made only along one side of the stream. Stream bed construction, reclamation, and rerouting would be completed prior to mining in the original, primary stream bed.
- Erosion protection devices, such as hay bales and screens, would be employed to protect streams and non-mined wetlands from erosion impacts.
- Where practical, surface mulch removed from wetlands to be mined would be transferred into wetland reclamation areas to enhance the rate of recovery of functional wetlands.

Approximately 440 acres of wetlands would be protected from development throughout the mine life. These areas would provide habitat for species displaced from other areas and additional plant and animal seed sources for reclamation activities.

3.3.3 Threatened or Endangered Species

3.3.3.1 Existing Conditions

The U.S. Department of Interior Fish and Wildlife Service (FWS) and the Florida Committee on Rare and Endangered Plants and Animals

(FCREPA) have published lists of species which are of concern due to their decreasing numbers. The species which have been listed by these agencies and which either have been observed or may occur on the site are discussed in this section.

Vegetation

None of the species which are included as endangered or threatened by the FWS (1980) was observed in the MCC study area. Harper's beauty (*Harperocallis flava*) and Chapman's rhododendron (*Rhododendron chapmanii*) are the only two species known to occur in Florida, and their current ranges are limited to the panhandle. Hence, the likelihood that either species occurs on the site is extremely low.

The FCREPA has listed 11 species (Pritchard, 1978), which have been discussed in detail in the ADA/DRI (MCC, 1977), including their current status and likelihood of occurrence in the study area. Spoonflower (*Peltandra sagittifolia*) which the ADA/DRI classified as a rare plant with a moderate chance of occurrence on the site was the only species on the Florida list observed on the site during this study. This population is a component of the swamp community located in Section 28 West. It is probable that it occurs in other parts of the property as well since this habitat type is common throughout the study area.

Animals

Ten federally listed vertebrate species occur or may occur on the site, while 40 vertebrates listed as threatened, endangered, of special concern, or of undetermined population status by the State of Florida may also occur (Table 3.3-3). Throughout the course of the field efforts, particular emphasis was placed on locating species listed by either of these agencies. The presence of 15 state or federally protected species is presently documented for the MCC site (Table 3.3-3).

3.3.3.2 Environmental Impacts

Proposed Action

Table 3.3-3 indicates the impacts from project activities on species which are or may be present on the MCC site and are listed by federal or state agencies as threatened, endangered, or otherwise of special status. Of the species known to be present on the site, several may incur long-term losses, while all would be affected for short periods by temporary loss of habitat and disturbance from mining activities.

Alternatives

The alternatives to the proposed action that modify impacts on terrestrial, wetland, or aquatic ecosystems (Sections 3.3.1.4 and 3.3.2.4) would also affect threatened or endangered species that might use these ecosystems in a similar manner. Thus, protection of important water-dependent habitats from drawdown impacts; mining of habitats that would require many years to reclaim only after successful development of replacement areas; and removal or avoidance of important species should adequately protect important species.

3.3.3.3 Mitigative Measures

The primary habitats on the MCC site that support important species are the xeric hammocks in the northwest areas of the site (Sections 22W, 27W, and 28W); marshes, such as those in Sections 4, 32, and 29; forested wetlands, such as in Section 29, and forested areas adjacent to southern portions of Brushy Creek. Most of the species in these habitats are mobile and would easily avoid mining activities so that minimal mitigative efforts would be necessary. However, some species, such as the indigo snake and gopher tortoise, are less effective in avoiding these disturbances. A preliminary survey of xeric habitats would be conducted to remove these species. Workers would be alterted to avoid direct destruction of individuals observed during construction activities.

TABLE 3.3-1

PRESENT ACREAGES OF VEGETATIVE COMMUNITIES AND ACREAGES AFFECTED BY PROPOSED MINING, CLAY STORAGE, AND/OR RECLAMATION PLANS

	Present Acreages[a]	Acres Undisturbed[b]	Acres Affected[c]
Upland Communities			
Pasture	5,040	1,405	3,635
Citrus grove	28	0	28
Palmetto range/Pine flatwoods	6,002	1,932	4,070
Mesic hammock	770	333	437
Xeric hammock	30	18	12
Subtotal	11,870	3,688	8,182
Wetland Communities			
Hardwood swamp	490	35	455
Fresh water marsh	2,490	405	2,085
Subtotal	2,980	440	2,540
TOTAL	14,850	4,128	10,722

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[a] Source: Winchester, 1980.

[b] The number of acres given are to be preserved from mining and clay storage activities.

[c] Includes areas affected by mining or clay storage.

TABLE 3.3-2

TIME-PHASED PROGRESSION OF WETLANDS LOST AND STREAMS AFFECTED BY PROPOSED MINING AND CLAY STORAGE PLANS AND GAINS OF WETLANDS BY PROPOSED RECLAMATION PLAN

	Marsh[a]			Swamp[a]			Cumulative Total Acres		5 cfs Streams[b]	
Years	Mining	Clay Storage	Reclaimed[c]	Mining	Clay Storage	Reclaimed[c]	Lost	Reclaimed	Oak	Brushy
1-4	212	98	-	25	11	-	346	-	0.25	-
5-8	178	100	-	41	6	-	671	-	-	-
9-12	173	42	112	95	34	-	1,015	112	-	-
13-16	89	63	-	30	-	-	1,197	112	-	-
17-20	317	69	12	105	17	-	1,705	124	1.0	-
21-24	196	45	201	56	1	32	2,003	357	-	0.5
25-28	149	54	216	28	-	25	2,234	598	0.5	0.75
29-32	300	-	719	6	-	76	2,540	1,393	1.1	-
33-36	-	-	158	-	-	165	2,540	1,716	-	-
37-40	-	-	202	-	-	92	2,540	2,010	-	-
Totals	1,614	471	1,620	386	69	390	2,540	2,010	2.85	[illegible]

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[a] Numbers represent approximate acres of wetlands to be lost by mining or clay storage or to be gained by reclamation.

[b] Numbers represent approximate miles of stream bed affected. Prior to mining, new stream beds will be established to replace sections lost.

[c] Represents approximate time period when reclamation is to begin. Length of time required for successful reclamation will depend on type and location of reclaimed wetland.

TABLE 3.3-3

POTENTIAL IMPACTS ON THREATENED OR ENDANGERED SPECIES

Page 1 of 2

Common Name	Status[a]	Likelihood of Occurrence	Degree of Short-Term Impact	Degree of Long-Term Impact
Mammals				
Round-tailed muskrat	SC	High	High: disruption of marsh habitat.	Low: reestablishment of marshes.
Sherman's fox squirrel	T	Present	High: disruption and loss of habitat.	Moderate: limited reestablishment of habitat.
Florida black bear	T	High	High: disruption and loss of habitat.	High: no planned reestablishment of habitat. Limited ability to recolonize.
Florida mouse	T	High	High: disruption and loss of habitat.	High: no planned reestablishment of habitat. Very limited ability to recolonize.
Birds				
Cooper's hawk	SC	Present	Moderate: disruption and loss of habitat.	Low: some habitat restored, good recolonizing ability.
Audubon's caracara	T	High	High: habitat loss and disruption.	Moderate: some habitat restored Species has somewhat limited recolonizing ability.
Common egret	SC	Present	Moderate: habitat loss.	Low: habitat restored.
Snowy egret	SC	Present	Moderate: habitat loss.	Low: habitat restored.
White ibis	SC	Present	Moderate: habitat loss.	Low: habitat restored.
Limpkin	SC	High	Moderate: habitat loss.	Low: habitat restored.
Florida scrub jay	T	Present	High: all habitat eliminated.	High: no habitat restored. Species has limited recolonizing ability.
Little blue heron	SC	Present	Moderate: habitat loss.	Low: habitat restored.

TABLE 3.3-3 (Continued)

Common Name	Status	Likelihood of Occurrence	Degree of Short-Term Impact	Degree of Long-Term Impact
Birds (continued)				
Florida sandhill crane	App. II, T	Present	High: disruption and habitat loss.	Moderate: some habitat restured.
Louisiana heron	SC	Present	Low: habitat loss.	Low: habitat restored.
Least bittern	SC	Present	Moderate: habitat loss.	Low: habitat restored.
Black-crowned night heron	SC	Present	Moderate: habitat loss.	Low: habitat restored.
Glossy ibis	SC	Present	Moderate: habitat loss.	Low: habitat restored.
Reptiles and Amphibians				
American alligator	Th, SC	Present	Moderate: habitat loss and disruption.	Low: habitat restored.
Eastern indigo snake	Th, T, SC	Present	High: habitat loss and disruption.	High: no planned habitat restoration. Species has limited recolonizing ability.
Gopher tortoise	App. II, T	Present	High: habitat loss and disruption.	High: no planned habitat recovery. Species has limited recolonizing ability.
Florida gopher frog	T	High	High: habitat loss and disruption.	High: no planned habitat recovery. Species has limited recolonizing ability.

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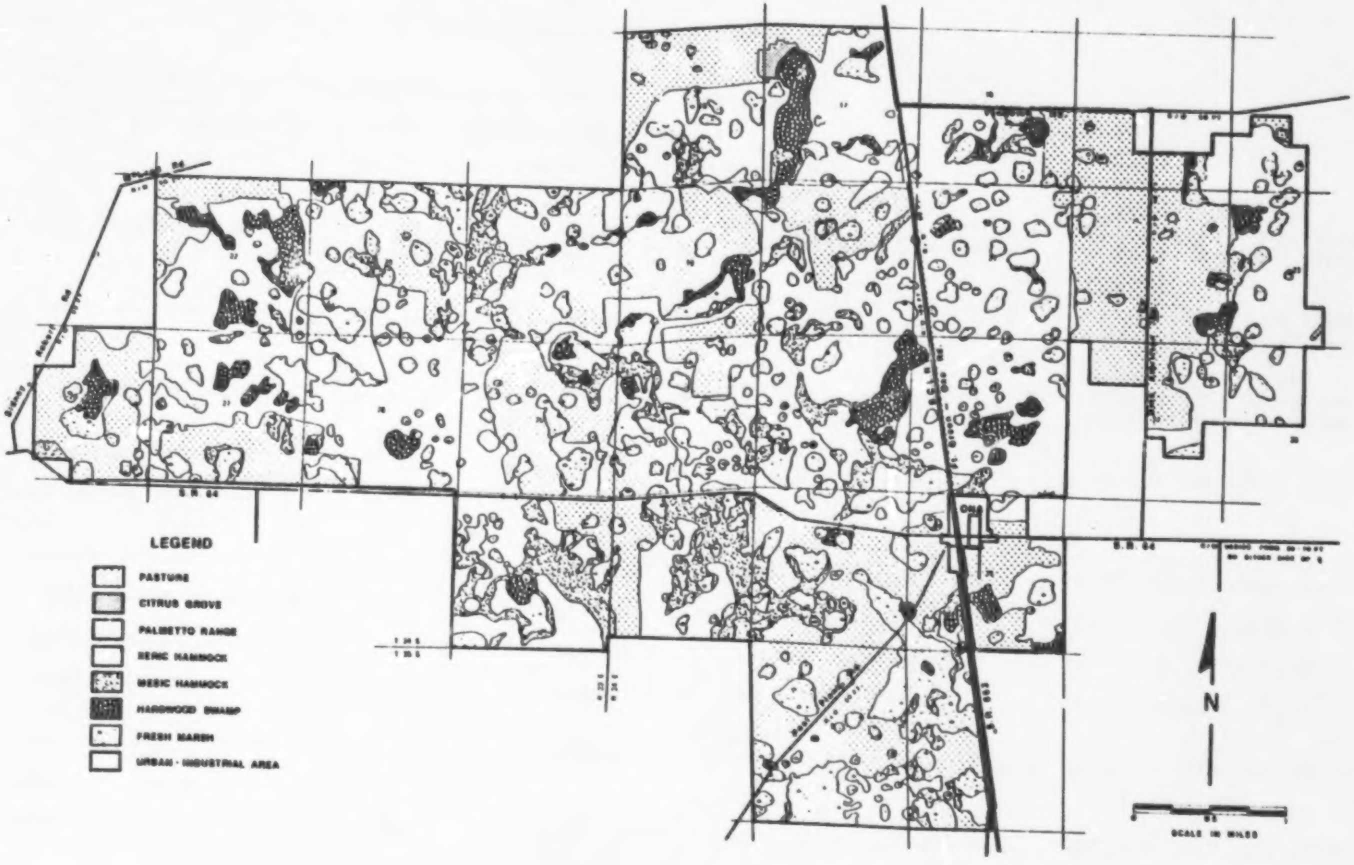
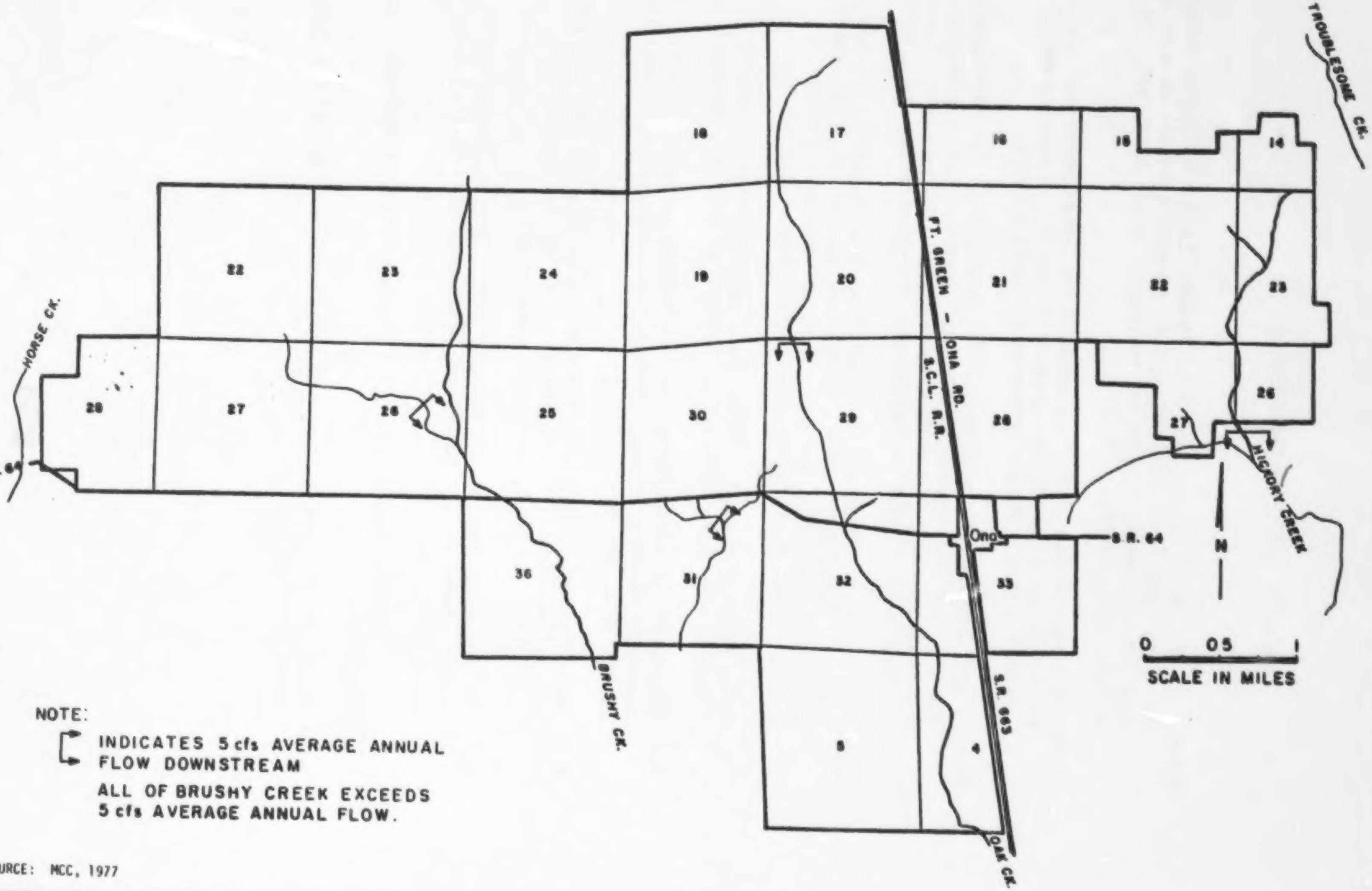
[a] Status - U.S. Department of Interior, Fish and Wildlife Service.
Th = Threatened
App. II = Species which may be threatened with extinction unless trade is regulated.

Status - Florida Committee on Rare and Endangered Plants and Animals.
T = Threatened
SC = Species of special concern


LEGEND
PASTURE
CITRUS GROVE
PALMETTO RANGE
XERIC HAMMOCK
MESIC HAMMOCK
HARDWOOD SWAMP
FRESH MARSH
URBAN · INDUSTRIAL AREA
S. R. 64
S. R. 64
N
SCALE IN MILES

SOURCE: MCC, 1977

Figure 3.3-1. Vegetation Map of MCC Property.


TROUBLESOME CK.
HICKORY CREEK
N
0 0.5 1
SCALE IN MILES
S.R. 64
Ona
S.R. 663
OAK CK.
FT. GREEN – ONA RD.
S.C.L. R.R.
BRUSHY CK.
HORSE CK.
S.R. 64
14
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4

NOTE:

INDICATES 5 cfs AVERAGE ANNUAL FLOW DOWNSTREAM

ALL OF BRUSHY CREEK EXCEEDS 5 cfs AVERAGE ANNUAL FLOW.

SOURCE: MCC, 1977

Figure 3.3-2. MCC Property Drainage.

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3.4 AIR RESOURCES

3.4.1 Climatology

Central Florida lies in a subtropical climatic zone where weather conditions are greatly influenced both by latitude and by the relatively warm coastal waters which surround the state. Chief characteristics of this climate are a temperature-humidity regime which is typically warm and moist with infrequent interruptions of cold air in winter and a generally distinctive division of the year into relatively dry and wet seasons.

Although there is no single prevailing wind direction throughout the year, winds from the northeast and east tend to predominate during all seasons. Southerly winds are also common during summer months, as are westerly winds in winter and spring. These patterns are based on observations made over a 20-year period at Lakeland, Florida, the nearest weather station from which wind data are available (Lakeland National Weather Service Office, 1975). The uniform terrain characteristic of this section of Florida decreases the likelihood of extreme differences in wind conditions between one point and another. Therefore, Lakeland data are considered representative of expected conditions at the Hardee County site. The average wind speed is 6.9 mph, based on a 12-year period of record (U.S. Department of Commerce, 1979).

Rainfall in the vicinity of the site, although generally abundant, shows wide variations from month-to-month and from year-to-year. Table 3.4-1 contains a record of rainfall measurements made near Wauchula, Florida, over a period of 45 years. Monthly precipitation at Wauchula has varied from zero to over 18 inches. The range of annual rainfall amounts is from 37 inches to 83 inches. However, annual rainfall totals in 13 of the last 17 years (through 1977) have been below the annual climatological normal of 54.66 inches; the annual mean for this 17-year period is 50.02 inches.

As would be expected for a humid, low-latitude locale, temperatures remain warm throughout most of the year. The mean annual temperature is 72.4°F, based on the 1941-1970 period of record (USDC, 1973). January has the lowest mean monthly temperature, 61.8°F, while August has the highest mean monthly temperature, 81.6°F. Extreme temperatures range from a low of 22°F to a high of 104°F, based on the 1933-1960 period of record (U.S Department of Commerce, 1955 and 1964).

Since required meteorological measurement data are not available from points in the immediate vicinity of the Hardee County site, air quality modeling must be based on representative regional meteorological data. The air quality modeling effort used surface and upper air meteorological data taken at the National Weather Service Station at Tampa, Florida during the 5-year period 1970 to 1974. These data are described in more detail in TSD-III, and in Environmental Science and Engineering, Inc., 1981.

3.4.2 Ambient Air Quality

3.4.2.1 Existing Conditions

There are six "criteria" air pollutants for which national ambient air quality standards (NAAQS) have been established: particulate matter (PM), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), and lead (Pb). The State of Florida also has ambient air quality standards (FAAQS), which are more stringent for some pollutants than the NAAQS. The pertinent NAAQS and FAAQS are presented in Table 3.4-2. The proposed MCC phosphate project will not emit significant quantities of CO, Pb, or volatile organic compounds (the chemical precursors of atmospheric O_3), so that the standards for these pollutants are not considered in this section.

In the vicinity of the MCC site, the nearest nonattainment areas for the NAAQS for PM, SO_2, and NO_2 are as follows:

PM - The nearest nonattainment area for PM, in which the secondary NAAQS are not met, is described as "that portion of Hillsborough

County which falls within the area of a circle having a centerpoint at the intersection of US 41 and State Road 60 and a radius of 12 km" (USEPA, 1978a). The boundary of this nonattainment area is approximately 60 km to the northwest of the MCC site.

SO_2 - The nearest nonattainment area for SO_2, in which the primary NAAQS are not met, is described as "the northwest corner of Pinellas County." This area is approximately 100 km to the northwest of the MCC site.

NO_2 - The entire State of Florida is unclassified with respect to the NO_2 NAAQS.

Existing ambient concentrations of PM, SO_2, and fluorides in the vicinity of the MCC phosphate project were assessed from a substantial body of monitoring data for these pollutants in the area. The location of the monitors is shown on Figure 3.4-1, and the monitoring data are summarized in detail in TSD-III. A summary of the highest observed concentrations of each pollutant is presented in Table 3.4-3.

Because the standards for the short-term averaging periods are stated in terms of values which are not to be exceeded more than once per year, the observed concentrations that should be compared to the standards are the highest second highest values measured at any of the reporting monitors. A comparison of Tables 3.4-2 and 3.4-3 indicates that existing levels of PM and SO_2 are well below federal or state air quality standards. The closest approach to a standard is the observed 24-hour PM second highest concentration of 110 $\mu g/m^3$, which is 73 percent of the pertinent FAAQS of 150 $\mu g/m^3$.

The State of Florida has no ambient standards for fluorides. State emission limiting standards exist for fluorides emitted from phosphate processing plants, but phosphate rock dryers are explicitly excluded from the standards (Florida Air Pollution Rules (FAPR), 17-2.05(6), Table II, Item C). Both phosphate rock dryers and beneficiation plants would fall under Item C(1)(i) of FAPR 17-2.05(6) Table II, which requires that all "[phosphate processing] plants, plant sections or unit operations and auxiliary equipment not listed elsewhere in Item C of the table" must comply with BACT provisions, as given in FAPR 17-2.03(1).

Approximately 3 percent of the particulate matter to be emitted by the MCC phosphate project will be fluorides. The fluoride measurements presented in Table 3.4-3 represent a measure of background ambient fluoride concentrations to which concentrations due to emissions from the proposed MCC phosphate project can be added. However, it is not possible to translate ambient fluoride concentrations into vegetative fluoride loadings or into fluoride dosage to cattle and other grazing animals.

Ambient monitoring data for NO_2 are not available for the vicinity of the proposed MCC phosphate project. However, high concentrations are primarily associated with urban areas since the primary sources of NO_2 are automobiles and major stationary sources such as large power plants. The nearest large power plant to the MCC site is the Florida Power & Light Company Parrish plant, located approximately 44 km to the west northwest. Given the rural character of the MCC site and the absence of nearby large stationary sources, it is reasonable to estimate an NO_2 background concentration of approximately 0.01 parts per million (20 $\mu g/m^3$) (USEPA, 1978b) for the area.

3.4.2.2 Environmental Impacts

Rock Dryer at Ona (Proposed by MCC)

Methodology - Estimated atmospheric emissions from the proposed MCC complex are great enough to require assessment of compliance with prevention of significant deterioration (PSD) increments for sulfur dioxide (SO_2) and particulate matter (PM), and with National Ambient Air Quality Standards (NAAQS). Compliance with these requirements has been assessed through the use of USEPA-approved computer modeling techniques. Compliance with Ambient Air Quality Standards (AAQS), national and State of Florida, was assessed by superimposing modeling results on ambient air quality measurement data. The monitoring measurements were used to represent ambient air pollutant background conditions.

A discussion of the computer models used in the analysis of air quality effects is given in the Technical Support Document (TSD-III). The computer dispersion models were run using maximum allowable emission rates for all sources. Emissions from sources with no applicable limiting regulation were calculated at maximum production capacity, reflective of maximum emissions. These analyses included the effects of interaction between pollutants released by the proposed MCC plant and other major sources in the area.

Emissions - The air pollutant-emitting facilities considered are a phosphate rock dryer, two small boilers, fuel combustion in mining equipment, a storage silo facility, dry rock loadout stations, and associated conveying operations. Particulate matter (dust) emissions from the fluid bed dryer and the dry rock silos would be controlled by wet scrubbers. Dust emissions generated by transferring stored rock via conveyor belts to the loadout stations would be controlled by a venturi scrubber.

BACT for all affected pollutants would be met by the use of appropriate control techniques and established quality control procedures for the operation of the proposed dryer, associated storage and transfer operations. The estimated atmospheric emissions from the above operations (after implementation of appropriate air quality control systems) are listed in Table 3.4-4; estimated emissions before implementation of air quality control systems are provided in Table 3.4-5.

Effects on Ambient Air Quality Standards - This section presents the expected impacts of the MCC complex on air quality during plant operation only. Pollutant emissions during site preparation and construction would have only a minor short-term effect on air quality. Emissions from mining and transportation activities were also not included in the modeling analyses as the effects would be small in comparison to the point sources (the two small boilers, the phosphate rock dryer, and the four scrubbers).

Table 3.4-6 presents the calculated highest, second-highest ground-level pollutant concentrations (maximum, in the case of annual average) during plant operation, the representative ambient background concentrations, and the State of Florida standards for comparison. The highest, second highest concentrations are given for short-term concentrations because the limits can be exceeded once per year at each receptor.

The maximum pollutant concentrations in Table 3.4-6, determined by summing the maximum calculated and the ambient background concentrations, were all below applicable AAQS. A hydrocarbon analysis was not performed since the proposed MCC complex would not be a major source of hydrocarbons, and the hydrocarbon standard is only a guide for assessing attainment of the ozone AAQS.

Fluorides are another pollutant of concern. Currently, there are no fluoride national or state AAQS, nor are there any emission limitation standards for fluorides emitted from the proposed MCC facility. The state regulations do require that the best available control technique (BACT) for fluorides emission control be used at the proposed facility. As discussed in TSD-III, neither gaseous fluoride emission nor particulate fluoride deposition is expected to be significant. The maximum estimated concentrations of gaseous fluoride due to the proposed facility operation were 0.0008 $\mu g/m^3$ and 0.005 $\mu g/m^3$, respectively, for the annual and the 24-hour averaging times. The maximum annual average particulate fluoride deposition was calculated to be less than 1.5×10^{-3} g/m^2, and the maximum 24-hour deposition was calculated as 1.2×10^{-5} g/m^3.

Effects on Prevention of Significant Deterioration (PSD) Increments - The estimated maximum increment consumption of the proposed phosphate rock processing complex is based upon maximum annual and highest, second-highest short-term calculated concentrations. Since there are no PSD increment limits for NO_2 or CO, only SO_2 and PM concentrations must be demonstrated to fall within the PSD increment limits. Table 3.4-7 sets forth these increment limits together with maximum calculated concentrations resulting from MCC's proposed action and interacting sources for comparison.

Based upon the modeling results, the FPL Manatee, IMC, and AGRICO sources interact with MCC to produce relatively small maximum concentrations in the affected area as presented in Table 3.4-8. The combined concentrations produced by the other sources interacting with MCC is less than the projected maximum increment consumption by the MCC complex alone.

The Chassahowitzka Class I area is located approximately 140 km from the MCC complex. Modeling results presented in the PSD indicate that TSP and SO_2 concentrations resulting from the proposed MCC operations would be below significant impact levels for this area.

Also, there should not be a significant impact on the Pinellas SO_2 and Tampa TSP nonattainment areas. These areas are approximately 100 and 60 km away, respectively.

Additional Impacts - Impacts on soils and vegetation from air pollutants associated with the proposed phosphate rock processing operations are expected to be of minor significance. As was presented in Table 3.4-6, the projected highest, second-highest 3-hour SO_2 concentration of 315 $\mu g/m^3$ and the annual mean concentration of 10 $\mu g/m^3$ are well below levels generally reported for damage to sensitive plant species. Particulate matter is generally considered to have relatively unimportant effects on vegetation. However, particulates from the MCC complex may contain about 1 1/2 to 3 percent fluorides. Since background levels of PM are low in the vicinity of

MCC's proposed operations and the projected impact levels due to operations are less than the background, it is expected that no significant fluoride impact on vegetation will occur as a result of the predicted increase in emissions.

No effect on plants or soils is expected from the low annual concentrations (1 $\mu g/m^3$) of NO_2 predicted to occur due to the proposed complex.

The proposed MCC source is not expected to significantly impair the visibility in the immediate area of the action, in the nearest PSD Class I area or in the nearest nonattainment areas. During the construction phase there would be a small transient impact on the local visibility due to fugitive dust raised by construction activity.

Summary - The proposed mining operation would result in a minor degradation of air quality in the vicinity of the mine site as a result of:

1. Combustion emissions associated with the operation of the phosphate rock dryer and the boilers at the site; and
2. Fugitive dust (particulate matter) associated with the rock dryer, boilers, scrubbers, transfer and handling of the phosphate rock and vehicular movement.

Based upon the atmospheric dispersion modeling results using worst-case meteorological conditions, 100 percent load conditions, and maximum allowable emissions from all MCC's operations including interacting sources, it is predicted that the allowable Class II PSD increments would not be exceeded as a result of the proposed MCC phosphate rock mining/processing operation. Also, no existing ambient air quality standard is expected to be exceeded, and no existing designated nonattainment areas would be significantly affected by this action. No significant impacts are expected upon soils, vegetation, and visibility in the area of the MCC plant.

The proposed MCC phosphate rock processing complex is expected to comply with all state and Federal PSD and air quality regulations. No NSPS would apply, but appropriate control techniques (generally BACT) would be used to control emissions.

Alternatives

Mining Methods - The proposed action would use an electrically-powered dragline to work the mine face. Alternatives considered are the use of a dredge or a bucket wheel excavator (BWE). The dredge would necessarily be diesel-powered, thereby involving increased exhaust emissions to the atmosphere. Because the dredge would work in a flooded mine pit, it would cause fewer emissions of fugitive dust than would the dragline. An electrically-powered BWE would apparently not cause atmospheric emissions significantly different from those generated by the dragline, but increased diesel exhaust emissions would occur if the BWE were diesel-powered.

Matrix Transport - The proposed action for use of matrix slurry pipelines (assumed powered by electric pumps) would involve no significant onsite atmospheric emissions. Alternative transport methods include the use of mechanical conveyors or truck transport. The conveyors would produce some increase in fugitive particulate matter emissions at the transfer points. Truck transport would produce considerable increases in diesel exhaust emissions and fugitive dust emissions from truck traffic on the plant roadways.

Ore Processing - Alternatives to the proposed action of wet process beneficiation of the ore matrix are dry separation and direct acidulation. Both of these alternatives would entail substantial increases in atmospheric emissions due to fuel combustion in the large dryers that would be needed to dry the entire mass of processed ore. The dry separation process would also entail increased fugitive particulate emissions from increased handling of dry rock. The direct acidulation technique would require substantial drying of the ore to allow efficient grinding and to prevent substantial dilution of the product phosphoric acid. The direct acidulation process would also pose a possibility of atmospheric emissions of sulfuric acid fumes.

Product Transport - Under the proposed action, dry product would be shipped by rail from Ona to Tampa, and from there, by barge to the MCC Pascagoula facility or to other buyers' chemical fertilizer plants. Alternatives would be truck transport or pipeline transport of product between Ona and Tampa.

The use of truck rather than rail transport would entail greater emissions of diesel exhaust pollutants and greater fugitive dust generation by truck traffic on highways.

The pipeline option would involve pumping a water slurry of the product, and thus could only be considered if wet rock product were to be shipped from Ona. Presumably, the pipeline would be electrically powered, so that railroad locomotive diesel exhaust would be replaced with emissions from electric-power plants. The construction of a pipeline would produce short-term fugitive dust emissions along the pipeline right-of-way.

Rock Dryer - There are two alternatives to the proposed action of drying the rock product at Ona. Both involve shipping only wet rock product from the Ona site and thereby eliminating the onsite rock dryer. The alternatives are: 1) installing a rock dryer at MCC's fertilizer plant in Pascagoula, Mississippi, or 2) modifying MCC's Pascagoula plant to process wet rock shipped from Ona. The effects of these alternatives on air quality are discussed in detail in TSD-III.

Because these alternatives would delete the rock dryer from the Ona site, each would significantly reduce atmospheric emissions at Ona. Both alternatives would, however, involve substantial increases in fuel combustion emissions in the Pascagoula area, where other large industrial plants are located near the MCC facility.

Alternative 1 would involve expansion of the materials handling and unloading facilities at Pascagoula in order to accept the wet rock shipments. The rock dryer that would be required at Pascagoula would have roughly one-third the capacity of the proposed rock dryer at the Ona site. Therefore, this alternative would replace rock dryer emissions at Ona with rock dryer emissions roughly one-third as large at Pascagoula. In addition, an unknown amount of additional rock drying would occur at other locations owned by customers buying wet rock from MCC and subsequently drying it for their own processing. Alternative 2 would require relatively extensive modification of the MCC Pascagoula plant in order to process the wet rock into fertilizer. The most important air quality aspect of this modification would be the addition of a boiler to generate process steam for the plant. The fuel combustion emissions from this boiler would be roughly comparable to those from the Ona rock dryer.

Both alternatives to MCC's proposed action would involve reductions in air quality effects in the area of the Ona mine site, but they would each involve significant increases in the air quality effects in the area of MCC's Pascagoula, Mississippi phosphate chemical processing facility. Rough quantitative Pascagoula area air quality analyses were made, taking advantage of readily available, previous modeling results done for a PSD permit application for a nearby project. This level of analysis (described in detail in TSD-III) was deemed appropriate to the decision-making function of the EIS process.

The results of the Pascagoula area air quality evaluations for both alternatives raise questions about possible permitting problems related to the levels of increased sulfur dioxide emissions assumed for each alternative. Although these alternatives would not necessarily in themselves threaten PSD Class I and II increment limits, they would require careful analysis because of potential interaction with other increment-consuming sources.

If either of the alternatives was selected over MCC's proposal, then the air quality permitting issues raised here would have to be addressed in a careful and extensive dispersion modeling effort as part of a PSD permit application for the Pascagoula site modification. This extensive modeling effort would be based on more refined engineering and design information than is currently available.

No Action - This alternative would produce no increase in emissions over those currently existing, either man-induced or naturally occurring, except as these emissions might otherwise increase in time regardless of action on the proposed project.

Postponement of Action - It is conceivable that postponement of the proposed action to an indefinite time in the future could result in reduced future atmospheric emissions from the project as a result of technological advances during the intervening time. Fuel combustion emissions from the rock dryer might, for example, be reduced or eliminated by technological advances in emissions control, in alternative energy sources, or in chemical processing of wet rock product.

3.4.2.3 Mitigative Measures

MCC's proposal includes the following air quality mitigative measures:

1) Restriction of construction and operating traffic to established access roads.

2) Wet spray suppression of roadway dust during construction activity.

3) Use of a totally wet beneficiation plant process, reducing the amount of fugitive dust generation from handling of dry rock.

4) Enclosure of dry rock storage and handling operations, with designed vents to the atmosphere sufficient to control air emissions by use of scrubbers or baghouses.

5) Stabilization of soil surfaces, as needed, within the plant boundary.

6) Surveillance of all mitigation and emissions control processes in order to assure their continued effectiveness.

These mitigative measures are described in greater detail in TSD-III, which also discusses mitigative measures applicable to the two rock dryer alternatives.

TABLE 3.4-1

MONTHLY AND ANNUAL MEAN AND EXTREME RAINFALL AT WAUCHULA, FLORIDA (in inches)

Month	Mean	Maximum	Minimum
Jan	2.20	7.26	0.03
Feb	2.79	8.92	0.19
Mar	3.39	9.22	0.08
Apr	2.85	8.26	0.00
May	3.99	11.32	0.01
Jun	8.66	18.40	2.40
Jul	9.04	15.54	2.80
Aug	7.48	15.53	2.97
Sep	7.88	18.06	1.19
Oct	3.05	10.36	0.00
Nov	1.63	6.43	0.02
Dec	1.70	4.83	0.11

Period of Record: Average = 1941-1970
Extremes = 1933-1977

Annual Rainfall Summary:

Mean - 54.66 in. (based on the 1941-1970 period of record)
Maximum - 83.48 in. (in 1953)
Minimum - 36.93 in. (in 1961)

From: U.S. Department of Commerce, 1955
U.S. Department of Commerce, 1964
U.S. Department of Commerce, 1962-1978
U.S. Department of Commerce, 1973

TABLE 3.4-2

NATIONAL (NAAQS) AND FLORIDA (FAAQS) AMBIENT AIR QUALITY STANDARDS FOR POLLUTANTS EMITTED BY THE PROPOSED MCC PHOSPHATE PROJECT

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$) Primary[a]	NAAQS ($\mu g/m^3$) Secondary[b]	FAAQS ($\mu g/m^3$)
PM	Annual[c]	75	60	60
	24-Hour[d]	260	150	150
SO_2	Annual[e]	80	-	60
	24-Hour[d]	365	-	260
	3-Hour[d]	-	1300	1300
NO_2	Annual[e]	100	100	100

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[a] Primary standards are established to protect human health.

[b] Secondary standards are established to protect human welfare and reflect studies of pollutant effects on economically important plants.

[c] Annual geometric mean.

[d] These standards are not to be exceeded more than once per year at any particular receptor location.

[e] Annual arithmetic mean.

TABLE 3.4-3

SUMMARY OF EXTREME AIR QUALITY MEASUREMENTS FROM 1977 THROUGH MID-1980 IN THE VICINITY OF THE PROPOSED MCC ROCK DRYER

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	Highest Second Highest Concentration ($\mu g/m^3$)
PM	Annual	39	-
	24-Hour	207	110
SO_2	Annual	17	-
	24-Hour	163	60
	3-Hour[a]	158	137
Fluorides (Gaseous)	Annual	<2.8	-
	24-Hour	9.97	-
Fluorides[b] (Particulate)	24-Hour	0.04	-

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[a] Data for the 3-hour SO_2 averaging period were available from only two monitoring locations.

[b] Data for the particulate fluorides were available from only one monitor location.

TABLE 3.4-4

ESTIMATED ATMOSPHERIC EMISSIONS, MCC COMPLEX, WITH CONTROLS

	POLLUTANT (ACTUAL)[a]													
	SO_2		NO_x		CO		HC		PM		Fugitive Dust		Gaseous Fluorides	
PHASE/FACILITY	LBS/HR	TPY[f]	LBS/HR	TPY	LBS/HR	TPY	LBS/HR	TPY	LBS/HR	TPY	LBS/HR	TPY	LBS/HR	TPY
Temporary														
Site Preparation	--	--	0.71	3.14	23.62	103.44	3.93	17.24	2.86	12.54	--	--	--	--
Construction	2.15	9.40	35.78	156.73	16.46	72.09	3.22	14.11	2.15	9.40	19.68	86.20	--	--
Sub Total	2.15	9.40	36.49	159.87	40.08	175.43	7.15	31.35	4.96	21.94	19.68	86.20	--	--
Mining/Operation and Processing														
Mining	2.76	12.07	5.58	24.45	1.79	7.84	0.40	1.73	0.42	1.83	20.00	87.60[b]	--	--
Wet Rock Storage	--	--	--	--	--	--	--	--	--	--	48.31	211.29[b,c]	--	--
Boiler #1	18.36	80.42	3.02	13.23	0.26	1.14	0.05	0.22	1.33	5.82	--	--	--	--
Boiler #2	10.94	47.92	1.80	7.88	0.16	0.70	0.03	0.13	0.79	3.46	--	--	--	--
Phosphate Rock Dryer	286.13	1,253.25	78.30	342.95[e]	6.75	29.57[d]	1.35	5.91[d]	20.28	88.83	--	--	0.04	0.18
Sub Total	318.19	1,393.66	88.70	388.51	8.96	39.25	1.83	7.99	22.82	99.94	68.31	298.89	0.04	0.18
Dry Rock Storage and Transport														
Scrubber #1	--	--	--	--	--	--	--	--	2.22	9.72	--	--	--	--
Scrubber #2	--	--	--	--	--	--	--	--	5.70	25.00	--	--	--	--
Scrubber #3	--	--	--	--	--	--	--	--	3.16	13.80	--	--	--	--
Scrubber #4	--	--	--	--	--	--	--	--	3.16	13.80	--	--	--	--
Sub Total	--	--	--	--	--	--	--	--	14.24	62.32	--	--	--	--
Facility Total	320.34	1,403.06	125.19	548.38	49.04	214.68	8.98	39.34	42.02	184.20	87.99	385.39	0.04	0.18
Transportation Railroad/Barge	0.02	0.09	1.65	7.21	3.86	16.93	0.71	3.13	0.01	0.55	--	--	--	--
Project Total	320.36	1,403.96	126.84	555.59	52.90	231.61[d]	9.69	42.47[d]	42.03	184.75	87.99	385.39[b,c]	0.04	0.18

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[a] Includes reduction due to proposed controls.

[b] Fugitive dust emissions include a substantial weight percent of coarse particulate matter (unlike dryer emissions) that will redeposit relatively close to the point of emission.

[c] Analysis of product particle size suggests methodology produces substantial over-estimation (99.98% > 40 μ m).

[d] Pollutant loadings generated by fuel combustion process for equivalent industrial boiler capacity. Reduced generation and/or removal may be expected in fluidized bed dryers and wet scrubbing devices.

[e] Based on field measurements conducted on a similar fluosolids dryer.

[f] TPY = Tons per year.

TABLE 3.4-5

ESTIMATED ATMOSPHERIC EMISSIONS, MCC COMPLEX, WITHOUT CONTROLS

	POLLUTANT (POTENTIAL)[a]													
	SO_2		NO_x		CO		HC		PM		Fugitive Dust[b]		Gaseous Fluorides	
PHASE/FACILITY	LBS/HR	TPY[f]	LBS/HR	TPY	LBS/HR	TPY	LBS/HR	TPY	LBS/HR	TPY	LBS/HR	TPY	LBS/HR	TPY
Temporary														
Site Preparation	--	--	0.71	3.14	23.62	103.44	3.93	17.24	2.86	12.54	--	--	--	--
Construction	2.15	9.40	35.78	156.73	16.46	72.09	3.22	14.11	2.15	9.40	19.68	86.20	--	--
Sub Total	2.15	9.40	36.49	159.87	40.08	175.43	7.15	31.35	4.96	21.94	19.68	86.20	--	--
Mining/Operation and Processing														
Mining	2.76	12.07	5.58	24.45	1.79	7.84	0.40	1.73	0.42	1.83	20.00	87.60	--	--
Wet Rock Storage	--	--	--	--	--	--	--	--	--	--	48.31	211.29[c]	--	--
Boiler #1	18.36	80.42	3.02	13.23	0.26	1.14	0.05	0.22	1.33	5.82	--	--	--	--
Boiler #2	10.94	47.92	1.80	7.88	0.16	0.70	0.03	0.13	0.79	3.46	--	--	--	--
Phosphate Rock Dryer	476.89	2,088.78	78.30	342.95[e]	6.75	29.57[d]	1.35	5.91[d]	21,600	94,608	--	--	0.04	0.18
Sub Total	508.95	2,229.19	88.70	388.51	8.96	39.25	1.83	7.99	21,603	94,619	68.31	298.89	0.04	0.18
Dry Rock Storage and Transport														
Scrubber #1	--	--	--	--	--	--	--	--	792	3,469	--	--	--	--
Scrubber #2	--	--	--	--	--	--	--	--	2,037	8,922	--	--	--	--
Scrubber #3	--	--	--	--	--	--	--	--	1,131	4,956	--	--	--	--
Scrubber #4	--	--	--	--	--	--	--	--	1,131	4,956	--	--	--	--
Sub Total	--	--	--	--	--	--	--	--	5,091	22,303	--	--	--	--
Facility Total	511.10	2,238.59	125.19	548.38	49.04	214.68	8.98	39.34	26,699	116,944	87.99	385.39	0.04	0.18
Transportation														
Railroad/Barge	0.02	0.09	1.65	7.21	3.86	16.93	0.71	3.13	0.01	0.55	--	--	--	--
Project Total	511.12	2,238.68	126.84	555.59	52.90	231.61[d]	9.69	42.47[d]	26,699	116,945	87.99	385.39[c]	0.04	0.18

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[a] Excludes reduction due to proposed controls.

[b] Fugitive dust emissions include a substantial weight percent of coarse particulate matter (unlike dryer emissions) that will redeposit relatively close to the point of emission.

[c] Analysis of product particle size suggests methodology produces substantial over-estimation (99.98% > 40 μ m).

[d] Pollutant loadings generated by fuel combustion process for equivalent industrial boiler capacity. Reduced generation and/or removal may be expected in fluidized bed dryers and wet scrubbing devices.

[e] Based on field measurements conducted on a similar fluosolids dryer.

[f] TPY = Tons per year.

TABLE 3.4-6

MAXIMUM CALCULATED GROUND-LEVEL CONCENTRATIONS FOR CRITERIA POLLUTANTS EMITTED BY THE PROPOSED MCC COMPLEX[a]

		Concentration ($\mu g/m^3$)			
Pollutant	Averaging Time	Calculated Impact	Ambient Background[b]	Calculated Plus Background	State of Florida Standard
Sulfur Dioxide	3-Hour	158	157	315	1,300[d]
	24-Hour	41	69	110	260[d]
	Annual Arithmetic Mean	6	4	10	60
Particulate Matter	24-Hour	16	90	106	150[d]
	Annual Geometric[c] Mean	2	28	30	60
Carbon Monoxide	1-Hour	3	--	--	40,000[d]
	8-Hour	2	--	--	10,000[d]
Nitrogen Dioxide	Annual Arithmetic Mean	1	--	--	100

---

[a] Short-term impacts represent highest, second-highest concentrations.
[b] Based upon highest recorded concentrations from ambient monitoring.
[c] Calculated from the annual arithmetic mean and geometric standard deviation obtained from ambient monitoring.
[d] Not to be exceeded more than once per year at any specified location.

Source: Environmental Science and Engineering, Inc., 1981a.

TABLE 3.4-7

HIGHEST, SECOND-HIGHEST CALCULATED SHORT-TERM SO_2 AND PM CONCENTRATION ($\mu g/m^3$) FOR PROPOSED MCC COMPLEX, INTERACTION SOURCES AND ALLOWABLE PSD CLASS II INCREMENTS

Pollutant	PSD Increments	MCC Only	MCC/Wauchula Power and American Orange	MCC/Mancini Packing	MCC/ FPL Manatee	MCC/ IMC	MCC/ AGRICO
3-Hour SO_2	512	158	110	100	98	87	53
24-Hour SO_2	91	41	29	30	26	20	20
24-Hour PM	37	16	8	7	9	--	7

Source: Environmental Science and Engineering, Inc., 1981a.

TABLE 3.4-8

SUMMARY OF PSD INCREMENT CONSUMPTION RESULTS FOR PROPOSED MCC COMPLEX

Pollutant	Maximum[a] Increment Consumption ($\mu g/m^3$) Averaging Time 3-Hour	24-Hour	Annual
Sulfur Dioxide			
MCC Point of Maximum Impact	158	41	6
MCC and FPL Manatee Interaction	98	26	--
MCC and IMC Interaction	87	20	--
MCC and AGRICO Interaction	53	20	--
Allowable Increment	512	91	20
Particulate Matter			
MCC Point of Maximum Impact	NA[b]	16	2
MCC and FPL Manatee Interaction	NA	9	--
MCC and IMC Interaction	NA	--	--
MCC and AGRICO Interaction	NA	7	--
Allowable Increment	NA	37	19

---

[a] The short-term impacts represent highest, second-highest concentrations.

[b] NA = Not Applicable

Source: Environmental Science and Engineering, Inc., 1981a.

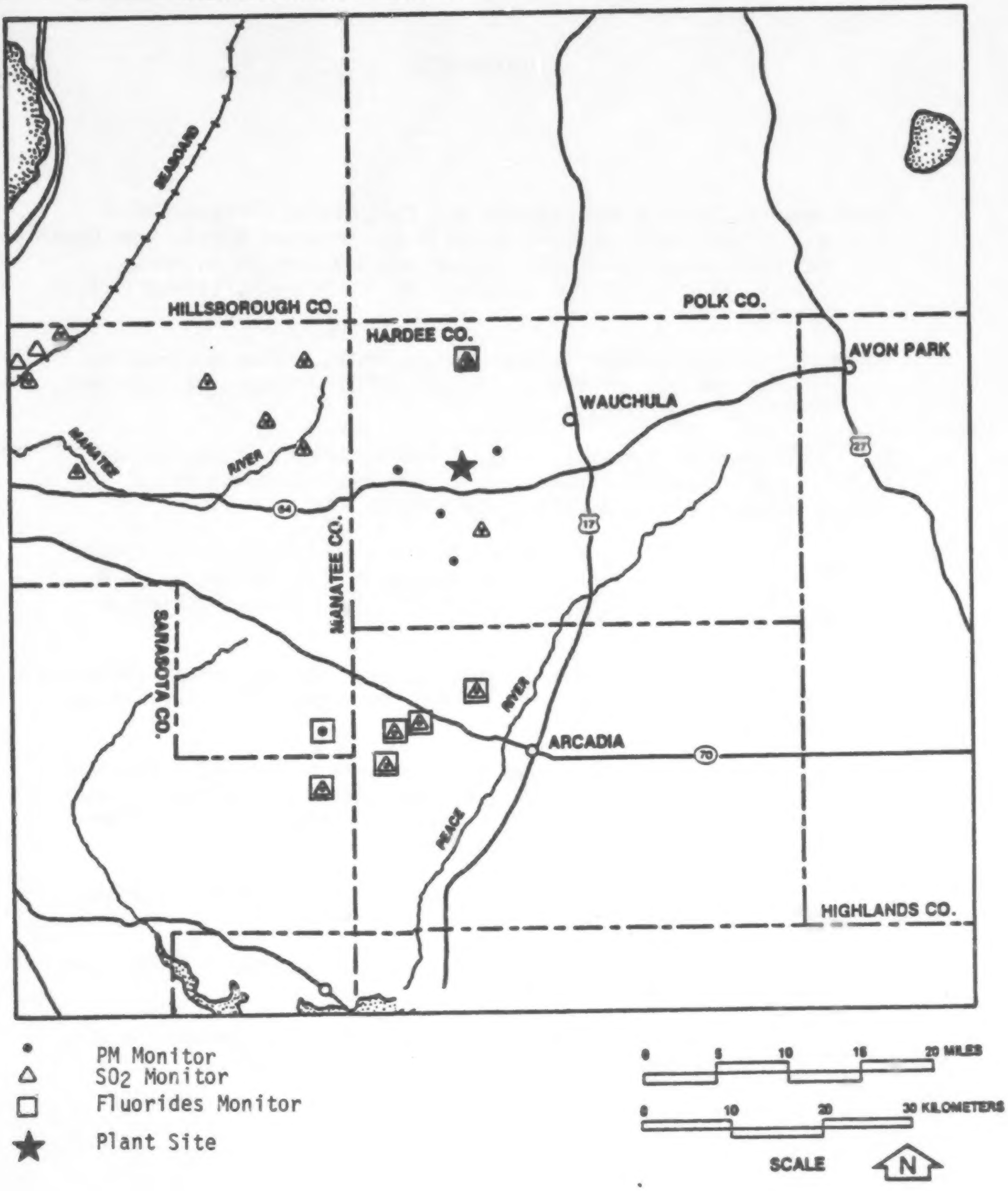
HILLSBOROUGH CO.
POLK CO.
HARDEE CO.
AVON PARK
WAUCHULA
SEABOARD
MANATEE
RIVER
64
27
17
MANATEE CO.
SARASOTA CO.
RIVER
ARCADIA
70
PEACE
HIGHLANDS CO.
● PM Monitor
△ SO2 Monitor
☐ Fluorides Monitor
★ Plant Site
0 5 10 15 20 MILES
0 10 20 30 KILOMETERS
SCALE
N

Figure 3.4-1. Locations of Air Quality Monitors in the Vicinity of the Proposed MCC Rock Dryer Site.

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3.5 HUMAN RESOURCES

3.5.1 Socioeconomics and Transportation

3.5.1.1 Existing Conditions

The following description of socioeconomic and transportation baseline conditions and impacts is a summary of the detailed data provided in TSD-IV, Human Resources. The seven-county region selected for study in this document includes Charlotte, DeSoto, Hardee, Hillsborough, Manatee, Polk, and Sarasota Counties (Figure 2.0-1). These counties were chosen due to the presence of phosphate reserves and the influence that mining may have on the counties' socioeconomic characteristics.

Population

Population within the seven-county region grew at the same rate as Florida between 1970 and 1979, 3.6 percent annually. Compound growth rates for both the seven-county area and the state were twice as high between 1970 and 1975 (4.6 percent annually) as in the last four years (2.3 percent annually) because the rate at which retirees and working people entered the state or study area decreased between 1970 and 1979.

The population in the study area is expected to continue to grow at the same rate as the state population between 1979 and 2020, 1.8 percent annually. With an expected growth rate of only 1.2 percent during that period, Hardee County is projected to grow more slowly than any of the other counties in the study area.

Employment

Unemployment rates for 1979 in counties that have a high number of retirees, such as Charlotte, Manatee, and Sarasota were lower than they were in the remainder of the study region. Agricultural counties such as Hardee and DeSoto had unemployment rates that were higher than the study area average, 8.0 percent and 6.5 percent, respectively, compared to 5.9 percent for the study region, and 6.0 percent for the state average. Due to the highly seasonal nature of agriculture in the region, unemployment rates in July 1980 were higher than the average rates in 1979 for all of the counties in the study region.

The percent of employment by industry in the study area changed very little between 1973 and 1978. Trade was the largest source of jobs in the study area, with 23 percent of total employment. Services, the second largest source of employment in the study area, accounted for 18 percent of total jobs in 1978; government accounted for 15 percent of total jobs in both 1973 and 1978. The large amount of government employment in the study area suggests that this sector may be well-developed to off-set the relatively under-developed economy of the area. Manufacturing was also a major employer in the study region; this sector accounted for 12 percent of total employment between 1973 and 1978.

In comparison with other counties in the study area, Hardee County has a higher portion of its employment in agriculture, which accounted for 29 percent of total jobs in the county in 1978. Other important employers in the county during 1978 were: government, with 15 percent of total employment; trade, with 14 percent of total employment; and "other" (including mining, agricultural services, forestry, fisheries, and other), with 14 percent of total employment.

There are few employment statistics for the mining industry in the study region. The best available information is the number of mining and chemical employees by place of residence. Mining and chemical employment accounted for roughly 1 percent, 6 percent, and 10 percent of the 1979 non-agricultural work force living in Hillsborough, Polk, and Hardee Counties, respectively.

Personal Income

Incomes in the counties of the study region ranged from $6,514 per capita in DeSoto County to $9,310 per capita in Sarasota County during 1978. Except for Sarasota County, all of the counties in the study region were below average U.S. per capita income levels in 1978. Small rural counties such as Hardee and DeSoto had the lowest income levels in the region, with 88 percent and 83 percent of the U.S. level in 1978, respectively. Sarasota, Charlotte, and Manatee Counties, which have a large number of retirees, have per capita incomes that are above or close to the state average. The per capita income in all of the counties of the study region rose faster (geometric rate of change of 10 percent) than the national average (8.8 percent) between 1969 and 1978.

Farm income represented 32 percent of total income in Hardee County in 1978, far above the study region average of 3 percent.

Basic and Nonbasic Industries

The growth of a region depends to a significant extent on the demand for goods and services exported to other sections of the country. Exported goods and services bring income into the region which is then spent and respent on goods and services produced in the local business sector. Location quotients, a measure of local employment relative to total U.S. employment, can be used to identify export and local sectors of the economy (Isard, 1973). A coefficient above 1.20 identifies export industries; a coefficient below 0.91 indicates that goods and services produced by these industries in the region are insufficient to meet the local demand and that these products are, therefore, being imported. Typically, in rural counties, a low coefficient means the residents are shopping in market centers outside of the county. The location quotient is greater than 1.20 in the study region in construction, non-farm proprietors' employment, and "other" employment. The location quotient for Hardee County is greater than 1.20 in agriculture, non-farm proprietors' employment, and "other." The large location quotient for "other" is due to the large amount of agricultural services.

Community Services and Facilities

The Central Florida Phosphate Industry Areawide Impact Assessment (USEPA, 1978) describes the services and facilities in the study region, and the ADA/DRI's for MCC (MCC,1977) and other phosphate industries in the area (CF Mining Corporation, 1976) contain detailed descriptions of Hardee County services and facilities.

Facilities and services in the study area and in Hardee County are currently at adequate levels for the existing population (MCC, 1977) and are expected to remain adequate through 1985 (Ford, 1980). However, housing availability is relatively low in Hardee County. Because housing availability is anticipated to be limited in the 1980's, workers are expected to commute to the project site rather than attempt to find housing in Hardee County (Ford, 1980).

Transportation

Three roads are expected to receive the bulk of the traffic which will result from the MCC project. These roads are US 17 (also designated as State Road 35), State Road (SR) 62, and SR 64 to the west and the east of the project site (Figure 2.0-1).

3.5.1.2 Environmental Impacts

MCC's Proposed Action

Expenditures and employment during the construction and operating phases of the project are described in the ADA/DRI (MCC, 1977) as well as in TSD-IV. The peak construction work force would be a maximum of 700 workers, and the operational phase would provide employment for 450 people. Construction expenditures would average about $47.5 million annually for two years; 90 percent of the expenditures are expected to be made in the study region and 10 percent of that amount is expected to accrue to Hardee County. Operational expenses are expected to be about $27 million annually, distributed in the same manner as construction expenditures.

Ninety percent of the required labor force for the project is expected to come from the study area, 10 percent of which is expected to come from Hardee County. Because housing is expected to be in short supply in Hardee County, there should be little change in residential patterns within the counties in the study region as a result of the MCC project.

Related to Hardee County's ability to provide community services is the tax revenue which would accrue to the county. Property taxes which would be paid to Hardee County by MCC each year are anticipated to range from $750,000 to $1,200,000. This is from three to five times the revenue the land would generate as agricultural land. Based on the 1981 rate of $1.67/ton, the severance tax on phosphate ore removed from the property would be $5,010,000/year. Annual expenditures by MCC for products and services would not be realized if the permit were not granted. State sales tax revenue on these expenditures is estimated to be between $747,000 and $914,000 per year (MCC, 1977).

The impact on population, employment, and personal income in the study region and in Hardee County as a result of the project is expected to be small. Expected impacts represent less than 1 percent of projected 1985 population, employment, and personal income for both the construction and operation phases of the project.

All of the highways are projected to provide satisfactory levels of service in 1985, with the exception of US 17. The service level along one portion of US 17 south of Bowling Green and north of SR 62 is expected to fall below a condition of stable flow even without the project (from service level C to D); this drop in service level would not be the result of project impacts, however (service level definitions of Pignataro, 1973). Some additional congestion is expected on this section of US 17 and on the unpaved portions of Vandolah Road and the Fort Green-Ona Road due to the project.

Assuming that 70 to 100-car trains would transport the phosphate rock to Tampa for loading onto barges, no significant adverse impacts are expected. Approximately three such trains would be loaded at the mine every two days; one typical barge would be filled every 2.3 days. If suitable, enclosed cars are not available or if congestion at the rail yards in Tampa should cause delays in train arrivals at the mine site, trucks might be used.

If trucks were to be used for rock transport, approximately 430, 20-ton trucks per day would be required to move the phosphate rock from the beneficiation plant. This represents a total of 860 truck passages per day (arriving and leaving) or one truck leaving the site approximately every 3 minutes. Assuming that, without the project, trucks would constitute 10 percent of the area's 1985 traffic, a total of 40 percent truck traffic would be expected with the project. Without the project, one truck would pass a given point on the highway every 7.5 minutes. With the additional truck traffic produced by MCC operations, a truck would pass a particular point every 1.4 minutes. This traffic level may not be acceptable over an extended period of time, especially in urban areas near the destination point of the loaded trucks. Truck usage can be considered feasible only for spot shipment or as a short-term supplement to rail cars. The complexity of operating such a large number of trucks indicates that stockpiling or reducing plant productivity might be necessary if the use of rail cars were curtailed over a long period of time.

In summary, the MCC project as proposed would have small positive impacts on the population, employment, and personal and tax income of the study area and Hardee County, and a small negative impact on transportation systems for certain portions of US 17, Vandolah Road, and the Fort Green-Ona Road.

Alternatives

Project alternatives under consideration would have little effect on the number of workers who would be employed on the project or where these workers would come from, nor would they affect sources of materials or location of project expenditures. Because these are the primary factors that influence socioeconomic impacts, impacts are not expected to change significantly as a result of the implementation of any of the project alternatives.

Waste Disposal/Reclamation Alternatives - The conventional method of separate disposal areas for waste clay and sand tailings in a land and lakes reclamation pattern would alter land use and agricultural potential on MCC property after mining operations are completed. Basically, the potential for agricultural production would be lower than with the proposed sand/clay cap method, but there may be some enhancement of recreation potential due to the creation of lakes. It is not possible to predict the net effect on income or tax levels within the county or region.

Product Transport - Should the phosphate be transported primarily by truck from the Ona mine to Tampa or other customer destinations, there would be a substantial increase in heavy truck traffic in the site vicinity and along major highways in the region.

No Action or Postponement of Action - Should the project be cancelled, the minor impacts identified for the proposed action could not occur. A delay in mining development probably would not change the substance or significance of any of the socioeconomic impacts identified previously.

3.5.1.3 Mitigative Measures

Because the project impacts on employment and personal income are expected to be positive in nature, mitigative measures for socioeconomic impacts are not considered applicable.

No measures to mitigate traffic impacts appear necessary even for the period when the construction work force level is at its peak. However, if traffic problems develop during peak construction periods, staggering work shifts would decrease traffic in the plant vicinity. Paving of the Fort Green-Ona Road and portions of Vandolah Road would also contribute to improved conditions in the plant vicinity.

3.5.2 Land Use

3.5.2.1 Existing Conditions

The seven-county regional land use patterns are discussed in the Central Florida Phosphate Industry Areawide Impact Assessment (USEPA, 1978). This section will therefore focus on a summary of land use patterns in Hardee County. More detailed data are provided in TSD-IV, Human Resources.

Hardee County

Land in Hardee County is used primarily for agricultural purposes. More than 75 percent of the county is in citrus, pasture, rangeland, or cropland, while only about 1 percent of the county is urbanized. The largest use of land in the county is rangeland, occupying almost 36 percent of the total county land area. Other uses of significance include cropland and pasture (26 percent), orchards, citrus groves, etc. (17 percent), and wetlands (17 percent). Mining uses were insignificant in 1975.

Citrus is by far the leading farm product in the county, followed by livestock production. The orange crop was valued between $65 and $75 million in the 1978 to 1979 season; cattle sales were valued at between $10 and $15 million in 1979 (Hayman, 1980).

Land used for residential, commercial services, and other urban purposes is expected to increase substantially between the years 1975 and 2000 due to expansion of the phosphate industry and the associated economic growth. The land expected to be converted to these uses is now agricultural land and rangeland.

It is anticipated that as much as one third of Hardee County might be mined and reclaimed by 2035. If so, mined land would account for approximately 134,265 acres. Most of this mining would occur on areas presently used for crops and pasture, citrus groves, rangeland, and forest. Proper reclamation would return this land to similar useful purposes.

Site

The MCC property accounts for almost 4 percent of the county's total land area. The existing percentage of land use or land cover on the MCC site and in Hardee County, based on USGS Land Use and Development Analysis (LUDA) categories, is indicated below (MCC, 1977):

Land Use Type (LUDA #)	Approximate Area (Acres) on Site	Approximate Percent of Site
Pasture (210)	5,040	34
Citrus Grove (230)	28	<1
Pine Flatwood, Palmetto, Forest Rangeland (411)	6,002	40
Xeric Hammock (421)	30	<1
Hardwood Swamp (621)	490	3
Mesic Hammock (422)	770	5
Fresh Water Marsh (641)	2,490	17
Urban (100)	0	0
Total	14,850	100

The percentage of rangeland, forest land, wetlands, and urban land contained on the site is similar to that found elsewhere in Hardee County. The MCC property has a greater percentage of pasture land and an especially low amount of land under cultivation for citrus products in comparison to the county as a whole.

Two agricultural products are produced on the MCC site: citrus and cattle. Based on estimations of the acreages and carrying capacities of each type of range and soil productivity levels, the entire MCC property could support approximately 1,200 to 1,500 head of cattle, depending on the condition of the range and the extent to which it has been grazed, as well as management practices. Based on similar calculations for citrus production and an average yield of 300 boxes per acre in Hardee County, the 28-acre citrus grove on the MCC site could provide approximately 8,400 boxes of oranges annually.

3.5.2.2 Environmental Impacts

MCC's Proposed Action

The total maximum annual loss in agricultural revenue, assuming that 100 percent of the site is removed from agricultural production as a result of the project, is estimated to be $655,000 to $805,000. This represents less than 1 percent of the value of total county agricultural production in 1979. In reality, the agricultural losses would not be this high since some of the land would remain in production while other parcels are being mined and reclaimed. If 10 or 25 percent of the land is being mined or reclaimed and is therefore out of production in any given year and if the orange crop is assumed to be completely lost, then the annual crop and livestock losses would be an estimated $115,000 to $130,000, for a 10 percent production loss, and an estimated $205,000 to $243,000 for a 25 percent loss in production. These losses are insignificant compared to 1979 Hardee County agricultural production.

Alternatives

Waste Disposal/Reclamation - The only change of possible significance which might result from implementation of alternatives would be the potential for poorer soil conditions and consequent lower productivity if conventional waste disposal and land and lakes reclamation selected. As indicated in Section 3.5.1.2, however, improved recreation potential would reduce the losses in revenue which might accrue due to the future land uses.

3.5.2.3 Mitigative Measures

Mitigative measures for land use would be undertaken through the reclamation process as required by local, state, and federal regulations. No significant adverse impacts on land use have been identified that would require further mitigative measures.

3.5.3 Historic and Archeologic Resources

3.5.3.1 Existing Conditions

An archeological survey of the MCC property conducted in 1975 by Dr. Jerald T. Milanich, Assistant Curator of Archeology of the Florida State Museum, revealed three historic period (20th Century) sites and four aboriginal sites. This study concluded that none of the sites was of significant importance to warrant preservation.

The three historic sites located were all 20th Century and have no historical significance. No salvage excavations or preservation was recommended for these sites.

Three of the four aboriginal sites are severely disturbed and eroded by 20th Century land clearing and/or agricultural activities. Because of this disturbance and the paucity of artifactual materials present, none of these sites are recommended for preservation or additional archeological investigations.

A fourth aboriginal site (Site No. 1, Figure 3.5-1) is most likely a campsite representing the Lake Okeechobee Basin Belle Glade culture. The site, representing a seasonal camp occupied for at least several years, was recommended for excavation prior to mining at this location, in order to recover archeological data pertinent to an understanding of the aboriginal cultures of South Florida (MCC, 1977). Since the cultural resources survey is included in its entirety as an appendix to the ADA/DRI, it has not be included in the Human Resources TSD-IV. The Department of Interior has indicated that Aboriginal Site #1 is eligible for the National Register of Historic Places (Appendix E). Consultation with the Advisory Council concerning this site is currently in progress.

3.5.3.2 Environmental Impacts

MCC's Proposed Action

It is anticipated that all of the archeological and historic sites would be altered during mining operations to the extent that the value of the sites would be lost. However, since the archeological survey conducted on the property revealed that none of the sites was significant enough to warrant preservation, very little impact due to the loss of these sites is anticipated.

Aboriginal Site #1 was considered for excavation or intensive testing to recover archeological data before mining is begun. It has been proposed that the excavation work take place after permitting of the mine is accomplished and before any mining takes place with the agreement of the State Historic Preservation Office. The archeologist selected for the work would submit a Plan of Study to the SHPO before any work is begun. The NPDES permit would be conditioned to include the requested excavation of the site.

Alternatives

None of the project alternatives would have a different affect on archeological and historic resources.

3.5.3.3 Mitigative Measures

Excavation and intensive testing of Aboriginal Site #1, as planned, constitutes the only mitigative measure which has been identified.

3.5.4 Noise

3.5.4.1 Existing Conditions

To adequately describe existing sound quality in the area of the proposed phosphate mine and beneficiation plant, background ambient sound levels were measured in accordance with ANS S1.13-1971 at four locations most representative of sound sensitive areas near the site. Location 1 was in the community of Ona; Location 2 was at the trailers on the east property boundary; Location 3 was at a residence on Vandolah Road along the northern property boundary; and Location 4 was at the New Zion Church (Figure 3.5-2).

Sound sources which were heard while measurements were being made were typical of a rural environment. These sources were traffic, farm animals, insects, dogs, birds, human activity, etc. A complete description of these noise sources is provided in TSD IV, Section 3.0, Noise.

Ambient sound levels were measured during four typical periods of the day (morning, afternoon, evening, and nighttime) using a sound level meter and tape recorder. The tape recordings were analyzed statistically to obtain A-weighted and octave band sound pressure level data. Table 3.5-1 provides a summary of the statistical A-weighted sound levels for each location and for each measurement period. Daytime and nighttime Equivalent Sound Levels and the day-night sound level (L_{dn}) are computed from these data and presented in this table. A description of the instrumentation and complete statistical data are presented in TSD-IV.

A review of Table 3.5-1 indicates that ambient sound levels at Locations 1 and 4 exceeded the USEPA-identified sound level of $L_{dn} = 55$ dB requisite to protect public health and welfare. However, the sound level at most communities in the United States exceeds this value. Therefore, the USEPA developed near term goals for reducing community noise to below $L_{dn} = 65$ dB. The day-night sound levels at the sound level measurement locations are all below $L_{dn} = 65$ dB. Insect noise was significant at night, thus increasing nighttime sound levels. Since the USEPA penalizes nighttime sound levels by adding 10 dB for computation of L_{dn}, the computed values shown in Table 3.5-1 are higher than would be indicated if computations used actual nighttime measurements.

3.5.4.2 Environmental Impacts

MCC's Proposed Action

A review of noise contributions from mining operations, plant operations, local roads, and railroads indicates that only the noise from mining would be significant. This is due to the close proximity of the mining activity to a few mine boundary residences and the town of Ona. The proposed mining activity would consist primarily of two draglines and would produce an equivalent sound level (L_{eq}) of

52 dB at a mine boundary residence when operating at a 500-foot distance (closest MCC would mine to residences). Since mining is a 24-hour operation, this would result in a day/night sound level (L_{dn}) of 59 dB at such residences. This L_{dn} would slightly exceed federal levels identified by the USEPA as requisite to protect public health and welfare (USEPA, 1974), but would not exceed the USEPA's near-term goal of reducing community noise below an L_{dn} of 65 dB (USEPA, 1977).

Alternatives

Mining Methods - Dredges and bucket wheel excavators were considered as alternatives to draglines. Neither would have a noticeably different effect on sound levels.

Plant Site Location - Beneficiation is not expected to have a significant effect on noise levels; therefore, alternative plant locations would not change expected noise levels at offsite receptor locations.

Matrix Transport - The effect on noise impacts due to conveyor and truck transport of matrix to the beneficiation plant was considered in conjunction with dragline mining. Noise impacts using conveyors would be unchanged from those of the proposed action. However, the combination of draglines, front-end loaders, and offroad trucks would produce substantially more noise than MCC's proposal. If the center of mining activity is 500 feet from residential property (the closest MCC would mine), the equivalent sound level might be as high as 71 dB. Including baseline sound levels, future day/night sound levels might reach as high as 77.7 dB at the various receptors. This sound level exceeds even the USEPA's short-term goal of 65 dB.

Product Transport - Transport of product to offsite customers would be most troublesome from the standpoint of noise impacts if significant truck shipments were utilized. No specific sound level impacts can be estimated, but highways are generally located closer to high density residential communities than are railroads. Slurry pipeline transport would have the least noise impact.

No Action - If mining were not allowed at the MCC site, baseline ambient noise levels would remain above 55 dB at Ona. The slight increase specified in TSD IV would not occur.

Postponement of Action - This should have no substantive effect on noise level impacts due to the mine, except to delay their occurrence.

3.5.4.3 Mitigative Measures

No mitigative measures are considered necessary for the proposed action; a suitable sound barrier would reduce noise levels at property boundaries, but only to existing sound levels which are already above the level identified by USEPA to protect public health and welfare.

For the alternative of matrix transport by truck, two approaches or a combination thereof could be used in an attempt to reduce sound levels to an L_{dn} of 65 dB at the nearest residences. One is to operate no closer than 2,000 feet from any offsite residence. The second is to construct a high berm or erect some other sound barrier on the property line between the mining equipment and the nearest residence. A berm which might provide 15 dB of attenuation would allow the mining operation to take place at a distance of 500 feet from the residence without exceeding an L_{dn} of 62.5 dB, which is below the USEPA's near-term goal of 65 dB. At this sound level, outdoor communications would not be affected, and residents should not be disturbed by mining activity sounds.

Nighttime sound levels at these residences would be approximately 56 dB if a barrier is used. With a typical outdoor-to-indoor attenuation (windows closed) of 15 dB, indoor sound levels would not disturb any resident's sleep.

TABLE 3.5-1

SUMMARY OF ENVIRONMENTAL SOUND LEVELS[a]

Location 1 (Ona)

Statistical Sound Level, dB		Morning	Afternoon	Evening	Night-time
	Date:	7/9/80	7/8/80	7/9/80	7/8/80
	Time:	1000	1430	1820	0000
L_{10}		59	68	58	50
L_{50}		49	49	46	49
L_{90}		43	43	42	48
L_{eq}		59.9	64.6	56.8	53.5

L_d = 62.1 dB
L_n = 53.5 dB
L_{dn} = 64.7 dB

Location 2 (East Property Boundary)

Statistical Sound Level, dB		Morning	Afternoon	Evening	Night-time
	Date:	7/8/80	7/8/80	7/9/80	7/8/80
	Time:	1120	1700	2000	2245
L_{10}		32	44	40	49
L_{50}		30	41	37	47
L_{90}		30	39	35	46
L_{eq}		32.3	41.9	38.8	47.4

L_d = 39.4 dB
L_n = 47.4 dB
L_{dn} = 53.3 dB

Location 3 (Vandolah Road)

Statistical Sound Level, dB		Morning	Afternoon	Evening	Night-time
	Date:	7/8/80	7/8/80	7/9/80	7/8/80
	Time:	1000	1610	2040	2345
L_{10}		46	49	48	48
L_{50}		38	43	42	47
L_{90}		36	42	41	47
L_{eq}		50.5	49	47.2	47.5

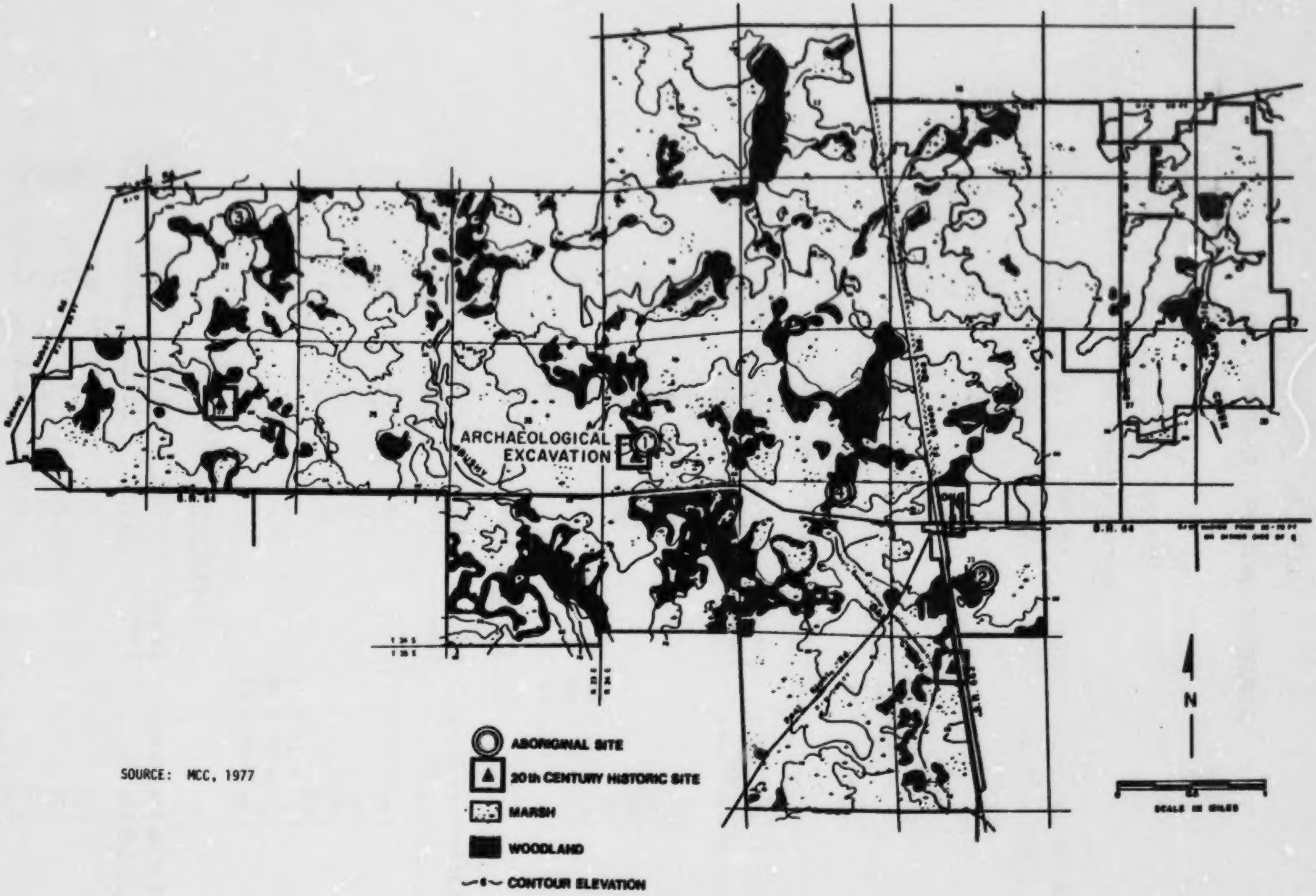
L_d = 49.2 dB
L_n = 47.5 dB
L_{dn} = 54.2 dB

Location 4 (Church)

Statistical Sound Level, dB		Morning	Afternoon	Evening	Night-time
	Date:	7/9/80	7/8/80	7/9/80	7/7/80
	Time:	1100	1430	1900	2230
L_{10}		45	42	53	56
L_{50}		38	37	53	56
L_{90}		36	36	51	55
L_{eq}		42.7	43.6	52.9	55.7

L_d = 48.3 dB
L_n = 55.7 dB
L_{dn} = 61.6 dB

[a] Nomenclature used in this table is discussed in TSD-IV.



ARCHAEOLOGICAL EXCAVATION
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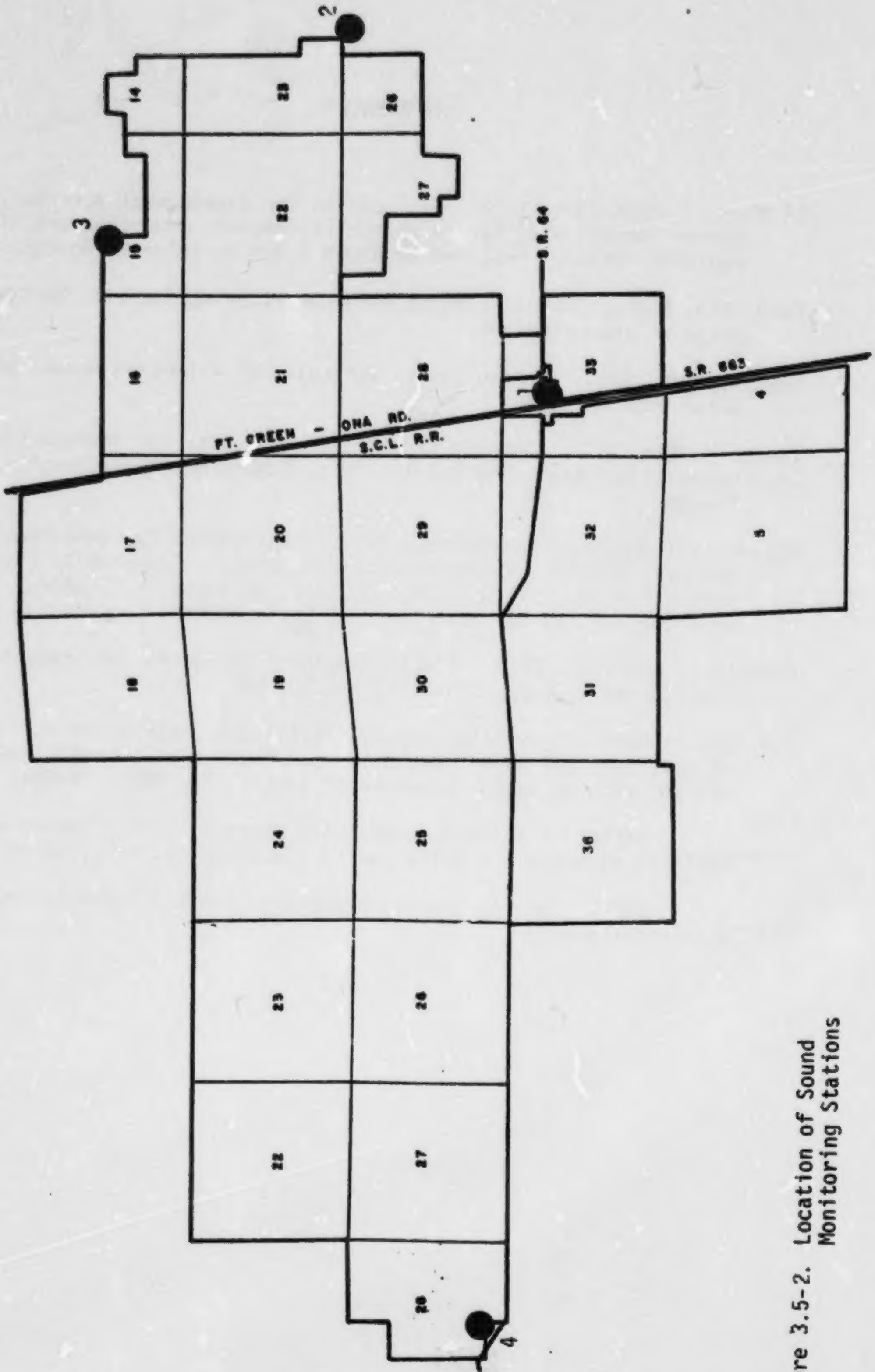
2
3
4
S.R. 64
N
SCALE IN MILES
ABORIGINAL SITE
20th CENTURY HISTORIC SITE
MARSH
WOODLAND
CONTOUR ELEVATION

SOURCE: MCC, 1977

Figure 3.5-1. Archaeological Sites on MCC Property.


2
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4
FT. GREEN - ONA RD.
S.C.L. R.R.
S.R. 663
S.R. 64
S.R. 64
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Figure 3.5-2. Location of Sound Monitoring Stations

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3.6 RADIOLOGY

3.6.1 Existing Conditions

3.6.1.1 Radionuclide Contents of Subsurface Materials

Most phosphate deposits contain uranium series radionuclide concentrations that may be significantly elevated above the mean value for the earth's crust. The higher uranium levels are associated with phoshorite deposits in which the uranium substitutes for calcium in the phosphate (Guimond and Windham, 1975).

Domestic ores generally contain between 50 and 200 ppm uranium on a dry weight basis (Guimond, 1977). This corresponds to 17 and 66 pCi/g of uranium-238, which is in radioactive equilibrium with its daughter products, at least through radium-226. Non-ore fractions may also contain elevated radionuclide concentrations. Topsoil may be slightly elevated above background due to deposition of daughter radionuclides from radon-222, which may diffuse upward from the ore body at rates higher than background (USEPA, 1978).

In a recent study (Roessler and others, 1978) of the radon emissions from unaltered lands in Florida, radon fluxes were measured at 26 sites in three counties. Results are presented in Technical Support Document (TSD) V. "Rule-of-thumb" predictors of radon flux were established based on the average radium-226 concentration in a 6-foot core.

3.6.1.2 MCC Site Sampling Program

A radiological baseline monitoring program of the MCC property was carried out to define existing concentrations of radioactivity in environmental media to form the basis for the assessment of the impacts of mining, waste disposal, and reclamation activities at the site. The activity concentrations of those radionuclides having the most significant impact on public health were monitored in air, soil, water, vegetation, and sediment. These radionuclides are uranium-238, the parent of the uranium decay series, and its daughters, radium-226 and radon-222. Uranium-238 is important because of its position as parent of the series and its abundance in phosphatic materials. Radium-226 is important because of its long biological half-life (it replaces calcium in bone) and its high toxicity. Radon-222, the gaseous daughter of radium-226, also has a high toxicity, primarily due to its alpha-emitting daughters which are inhaled along with the parent gas.

The majority of the phosphatic radioactive materials at the MCC site are found in the surficial deposits and the Hawthorn Formation. The highest levels of radioactivity in the Hawthorn Formation occur at depths of 150 to 200 feet. Mining activities at the site will disturb only the upper 100 feet of the surface so that little, if any, of the material in the Hawthorn Formation will be redistributed. The disturbed region is composed of several types of materials (Figure 3.6-1). The upper 15 to 20 feet consists mainly of unconsolidated, fine to medium-fine grained, medium-sorted, unconsolidated quartz sands (P.E. LaMoreaux and Associates, Inc., 1976). These surficial sands and the overlaying topsoil contain little or no phosphate and little radioactivity (Figure 3.6-2). The surficial sands are underlain by a thin layer of leached phosphate gravel and pale, greenish-yellow clay (the leached zone) which is depleted in calcium phosphates but contains relatively high levels of radioactivity. Below the leach zone and extending to a depth of about 100 feet, is the phosphate ore body or matrix.

Depth-weighted mean radium-226 concentrations of subsurface materials at the MCC site (in units of pCi/g dry) are: 1.0, upper layer of overburden; 4.0, overburden (surface to top of leach zone); 23.9, leach zone (where it exists); 6.2, overburden (surface to matrix); and 5.5, matrix.

Radium-226 in soil can be absorbed by vegetation and subsequently be ingested by man.

Ambient (natural) external gamma radiation exposure is derived from cosmic and soil (external terrestrial) sources. Each of these sources usually provides about equal exposure. Based on field measurements, external terrestrial radiation is estimated to be 1.8 μR/hr at the MCC site.

Radon originates from the decay of radium in soil and rock at a rate dependent on the permeability of the ground cover, soil moisture content, meteorological conditions, and other variables. Sampling at the MCC site yielded an overall mean of 0.37 pCi/m^2-sec, which is slightly higher than data reported for the central Florida phosphate region, but slightly lower than that for the continental United States.

Ambient concentrations of gaseous radon-222 and radium-226 (in particulates) depends on local source strength and on atmospheric dispersion characteristics. Average concentrations of Rn-222 on the site were 0.36 pCi/liter; for Ra-226, average concentrations were 0.30 fCi/m^3 (0.30 pCi/liter).

Measurements were also made of Ra-226 concentrations in surface and ground water on the site. Streams on the site do not cut deep enough to expose the phosphate matrix and derive 25 to 40 percent of their annual flows from the surficial aquifer. Measurements show average surface water concentrations of 0.6 pCi/liter and average surficial aquifer concentrations of 5.2 pCi/liter.

The concentration of dissolved radium-226 in central Florida ground water has been the subject of numerous studies. Data obtained in programs conducted by the USEPA and USGS indicate that the average radium-226 concentration is highest in the Upper Floridan aquifer (2.86 pCi/liter) and about an order of magnitude less in the surficial aquifer (0.22 pCi/liter). The concentration in the single MCC sample taken from the Upper Floridan aquifer shows 7.05 pCi/liter, while site data for the Lower Floridan aquifer range between 1.11 and 1.80 pCi/liter.

3.6.2 Environmental Impacts

3.6.2.1 MCC's Proposed Action

The proposed mining, beneficiation, and reclamation activities would increase radiation levels in certain environmental media as a result of the redistribution of the radioactivity contained in materials which presently lie below the surface of the property. In the following section, estimates are made of these increases and of the resulting increased exposure of people living in the vicinity of the site.

Ambient Gamma Radiation Levels

Mining activities would cause a substantial redistribution of the upper 100 feet of surficial materials. Though much of the total radioactivity would be shipped off-site with the product, the remainder would become more accessible to the surface environment. The concern addressed in this section is potential post-reclamation exposure to gamma radiation levels through future uses of the land, such as for residential development. Using measurements of radium-226 levels in MCC soils, data on mine and waste product radioactivity levels, and the proposed mine reclamation plan, calculations were made of Ra-226 levels for the upper six feet of reclaimed lands (Table 3.6-1). For the proposed reclamation plan, Ra-226 levels would range from a low of 1.3 pCi/g for covered tailings to 4.9 pCi/g for covered slimes. The corresponding ambient gamma radiation levels are listed in Table 3.6-2. The total gamma radiation level on covered slimes would exceed the USEPA (1976) recommended level of 10 μR/hr , though it would be well below the maximum level of 20 μR/hr being considered by the State of Florida (FDHRS, 1980). Both recommended limits are designed to prevent excessive exposures to radon-222 and its daughters in structures built on reclaimed lands (see air quality discussion).

Air Quality

The radon fluxes from the various reclaimed land types are listed in Table 3.6-2. Though the fluxes are up to 2.5 times the levels from undisturbed overburden, they are substantially less than the limit of 3 pCi/m^2-sec above national background being considered by the state of Florida (FDHRS, 1980).

The indoor radon daughter working level (WL) is used to assess the dose to the lung resulting from inhalation of radon daughters such as would be emitted from the reclaimed MCC lands. Three parameters, external terrestrial gamma exposure rates, soil Ra-226 concentrations, and radon fluxes, are commonly used to predict indoor working levels. Table 3.6-2 contains the averaged results of working levels predicted on the basis of these three parameters. Though the interim standards being considered by the State of Florida do not explicitly limit WL, the USEPA (1979) has proposed a limit, including background, of WL <0.020. Using a background level of 0.009 (USEPA, 1979), the WL in buildings erected on covered slimes would exceed the proposed limit. It should be noted that the WL limitation assumes 100 percent occupancy in a closed residence for a full year and would not be applicable to temporary occupation of structures on the reclaimed land.

Airborne radon concentrations and working levels were calculated for various receptor locations at the site boundary and in Ona during operation of the mine with and without the rock dryer and after reclamation of the land. The calculated increases in airborne radon concentrations would not be detectable above measured baseline for any phase of the mine activity.

Airborne concentrations of radium-226 due to particulate releases from the proposed project were also calculated, as were ground concentrations resulting from particulate deposition. Airborne concentration increases would not be detectable above baseline during any phase of the mine activity, even with maximum operation of the rock dryer. Maximum ground concentrations during operation of the dryer are calculated to be 3 percent above ambient, which is not expected to cause measurable increases in gamma exposure rates, soil Ra-226 concentrations, or radon fluxes.

Water Quality

Water quality effects were calculated only for radium-226, as this is the most hazardous and soluble of radionuclides found in phosphatic materials.

Surface water impacts could result from process effluent discharges, seepage into collection ditches, or surface runoff. Effluent discharge would occur only during high rainfall conditions, when overflow from the clear water pond is allowed. Such water is expected to contain 1.0 pCi/l total (suspended and dissolved) radium-226 compared to the total of 1.8 pCi/l observed in area streams during baseline monitoring. The suspended solids content of pond seepage reaching surface water would be negligible after migration through soils; the dissolved radium-226 concentration should be <2 pCi/liter (Guimond and Windham, 1975). Most runoff during mining operations would be collected for mine use and recycling. After reclamation, the average radium-226 concentration of surface soils is expected to increase to 3.4 pCi/g from the baseline value of 1.0 pCi/g. Since these soils are the source of suspended solids in surface runoff, a slight increase in suspended radium-226 concentrations may occur in streams receiving the runoff during periods of rainfall. Data are not available to allow estimation of the magnitude of any such increases in surface runoff radium-226 concentrations; however, even if it is assumed that the increase will parallel the increase in soil radium concentration, the USEPA guideline of 9 pCi/l for phosphate industry effluents would not be exceeded.

Ground water could be affected by a change in the radium-226 concentration in materials which contact the surficial aquifer, or by seepage into the aquifers coupled with aquifer withdrawals. Taking into account the mining of matrix and the relative areas of reclaimed land types, the average radium concentration of material in contact with the surficial aquifer is expected to decrease from 5.2 pCi/liter to about 4.3 pCi/liter. Seepage into the aquifer from surface impoundments would have a minimal effect due to low suspended-solids content.

Most of the ground water withdrawals would be from the lower unit of the Floridan aquifer, which has a lower level of radioactivity than either the upper unit or the surficial aquifer.

Individual and Population Dose Commitments

Using data on various pathways of possible radionuclide dosages to humans (inhalation, ingestion, and direct exposure), calculations were made of annual individual and population dose commitments. Individual doses were calculated for locations at the plant boundary and in Ona. Population doses were calculated within an 80 km radius of the facility.

Individual dose commitments are expected to be highest for the operational phase of the project with onsite rock drying, but the maximum dose calculated (0.391 mrem/year) is less than 0.5 percent of the annual dose to the general public (82 mrem/year).

Population dose commitments are highest during the post-operational phase of the project due to the larger radon source terms and high radon gas mobility. Estimates of population dose commitments were made using conservative assumptions that all food produced in the region is consumed by the 1.16 million people living within 80 km of the site. Detailed calculations of dose commitments were made only for land and lakes reclamation with conventional waste disposal practices; total doses (in person rems/year) after reclamation are calculated to be 3.51 (whole body), 17.1 (bone), and 4.11 (lung). These commitments are considered negligible. For the proposed method of sand/clay capping, the leach zone would be covered by many feet of material and dose commitments would be even lower.

3.6.2.2 Alternatives

Mining Methods

Dredges - Although dredges, unlike draglines, cannot readily separate leach zone materials from the generally less radioactive overlying overburden, this would not have significance for radium-226 levels on the MCC site because of the large quantity of clay which will effectively bury any leach zone spoil (Figure 2.1-1).

Particulate emissions from mining operations would be virtually eliminated by the use of dredges, since the overburden would be submerged or handled as slurry. This would further reduce the already insignificant dose commitments resulting from dragline mining.

Bucket Wheels - The radiological characteristics of the overburden used for dike construction and reclamation using a bucket wheel would be the same as that of overburden stripped by draglines. Particulate emissions may increase if a dry method is used to transport the overburden to disposal areas.

Plant Site Location

The alternative plant locations, (i.e., the waste disposal centroid and the mining centroid) both are to the southwest of the proposed Vandolah site and would not be expected to cause any significant increases in radiological impacts during either the post-reclamation phase or the operational phase with off-site rock drying. This is due to the fact that airborne emission sources in these cases are diffuse area sources rather than point sources. Effects due to onsite rock drying are described below.

Waste Disposal Centroid - Based on the wind frequency distribution, location of the rock dryer at the waste disposal centroid would be expected to shift the maximum boundary individual dose commitment location to the northwest corner of Section 19. It is expected that individual dose commitments at Ona would be slightly less than the maximum and that these individual dose commitments would present no significant health hazards.

Mining Centroid - Location of the rock dryer at the mining centroid would not be expected to result in any significant health hazards. However, because of the strong easterly component of the wind frequency distribution, this alternative would be expected to produce the highest individual dose commitments at Ona of all the rock dryer locations considered.

Matrix Transport

Conveyors - Use of an enclosed conveyor to transport matrix to the beneficiation plant would be expected to result in a slight increase in release rates of airborne particulates and therefore a slight increase in airborne and ground level radium-226 concentrations. Information is not available to quantify the increase.

Trucks - Use of trucks to transport matrix to the beneficiation plant would be expected to result in a substantial increase in airborne particulates. Since these heavy trucks would traverse undisturbed areas, the additional particulates would contain relatively little radioactivity, however, and would be similar to particulates released from draglines operation. If particulate release rates are assumed to equal those from dragline operations, dose commitments would increase to levels roughly equal to those estimated for the operational phase with on-site rock drying.

Beneficiation

Dry Separation - Although quantitative estimates of particulate emissions from dry separation processing are not available, it is expected that they would exceed emissions from the rock dryer and result in higher individual dose commitments at all receptor locations.

Direct Acidulation - This experimental process is not currently available. Since it requires drying and grinding of the matrix, it is not expected to represent a reduction in particulate emissions compared to the proposed action.

Water Sources

Water source alternatives involve variations in the percentages of water withdrawn from surface water and the Lower Floridan aquifer. Although the dissolved radium-226 concentration of surface water is about half that of the Lower Floridan aquifer, both concentrations are low (<2 pCi/liter) and insufficient surface water is available to make a significant difference in the radium-226 concentrations of the overflow and seepage waters.

Liquid Effluents

In all proposed and alternative actions, engineering designs are such that the only source of liquid effluents is expected to be overflow from the clear water holding pond during periods of extremely heavy rainfall. Since suspended and dissolved radium-226 concentrations are at a minimum in the holding pond, no significant impacts are expected.

Rock Drying

Drying the phosphate rock onsite increase both radon gas and radium-226 (in particulates) emissions; consequently, individual and population dose commitments are increased. However, all of the increases are at most a few percent of natural background levels and would not be detectable or significant to public health.

Shipping wet rock to customers which require dry rock (such as MCC's Pascagoula facility) would simply shift the radionuclide emissions associated with rock drying to other locations.

Waste Disposal - Reclamation

Conventional Waste Disposal with Land and Lakes Reclamation - This alternative is evaluated in detail in TSD-V. It represents the worst case from the standpoint of radiological impacts. The evaluation assumed four-foot thick overburden covers, with leach zone intermixed, on all reclaimed waste disposal areas (Table 3.6-1). Radon releases were found to be nearly twice those of the MCC proposed action. Both terrestrial gamma radiation levels and calculated indoor working levels exceed (or nearly exceed) recommended limitations on reclaimed slimes and tailings. Airborne concentrations of radon and of radium-226 would be slightly elevated compared to the proposed action. Resulting individual and population dose commitments were found to be negligible.

Sand/Clay Mixing (Sand/Clay Ratio = 2:1) - This alternative cannot be implemented at the MCC facility because of the low sand content of the matrix. If it were to be implemented, radiological impacts would fall between those of the proposed plan and land and lakes reclamation, based on the radium-226 concentration of 2.3 pCi/g of the sand/clay mix to be used for cover material.

Flocculation - Flocculation of waste slimes to speed settling might increase radon flux by a few percent as the result of an increase in the effective diffusion coefficient. The magnitude of any increase in flux would be best determined by direct measurement.

Preservation Alternatives

Preserving large areas of wetlands at the mine site would reduce the amount of phosphate ore mined and beneficiated. For example, two of the alternative preservation plans would remove about 30 percent of the mineable resources from development. This would reduce emissions of radionuclides and also eliminate redistribution of radioactive materials on those lands.

Product Transport

Conveyor - An 80 km conveyor would be prohibitively expensive and result in particulate releases not encountered with other options.

Truck - Shipment of product in closed trucks is expected to produce airborne emissions of radioactivity equivalent to shipment in closed rail cars.

No Action

If the MCC site were not mined, no change in present levels of radioactivity and radionuclide releases would occur. However, it has been shown that, with the exception of possible excess ambient gamma radiation levels and indoor working levels in buildings constructed on covered slimes, no detectable adverse impacts are expected from the proposed action.

Postponement

Development of economically sound technologies to extract additional phosphate values from waste clays is an area of active research. Since the radioactivity of beneficiated products and wastes normally follows the phosphate content, such technologies could ultimately reduce radon releases from waste clays. However, while such technologies may be economical for mines with high grade matrix, it is doubtful that the cost of applying such methods to the low grade materials from the MCC site would justify any resultant decrease in radon releases.

3.6.3 Mitigation

The only potential adverse effect which may require mitigation is the excess working level (WL) expected, based on radon daughter concentrations inside closed structures which might one day be built on covered clay slime wastes (4,952 acres). Approximately 4,100 acres of slime ponds would be covered with a 4-foot sand/clay cap which would reduce indoor WL's (marginally) below recommended limits.

Additional mitigation could be in either of three forms: (1) additional coverage with sand tailings or other low radioactivity material to a depth sufficient to lower WL throughout the whole site; (2) selective placement of topsoil as part of landscaping and foundation work should future land use plans result in construction of residences on these lands; or (3) zoning to prevent construction of full-time residences on reclaimed lands which are determined to exceed recommended limits.

TABLE 3.6-1

RADIUM-226 CONCENTRATIONS OF MATERIALS ON MCC SITE BEFORE AND AFTER RECLAMATION (pCi/g)

				Reclaimed Lands[c]			
Baseline Conditions[a]		Mine Products and Wastes		MCC's Proposed Plan		Conventional Method	
Undisturbed Overburden (0-6 ft.)	1.0	Product	15.6	Capped Slimes[d]	2.6	Slimes[f]	5.8
		Clay Slimes	5.1	Covered Slimes[e]	4.9	Tailings[f]	4.4
Total Overburden including leached zone	6.2	Sand Tailings	0.8	Covered Tailings[e]	1.3		
		Sand/Clay Cap	1.3[b]				
Total Overburden, excluding leached zone	4.0						
Matrix	5.5						

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[a] Depth-weight arithmetic averages.

[b] Sand/clay ratio = 8:1.

[c] Activities are averaged over the upper six feet of material.

[d] Based on 4-foot thick sand/clay cap.

[e] Based on 1-foot thick overburden (excluding leach zone) cover.

[f] Based on 4 feet of overburden (including leach zone) cap.

TABLE 3.6-2

SUMMARY OF RADIOLOGICAL PARAMETERS - SAND/CLAY MIX CAP RECLAMATION PLAN (PROPOSED)

Reclaimed Land Type	Acres[a]	Ra-226 Concentration in Upper Six Feet (pCi/g)	Total Gamma Exposure Rate[b] (μR/hr)	Radon Flux (pCi/m^2-sec)	Indoor Working Level[c] (WL)
Undisturbed Overburen	4,530	1.0	5.3 (1.8)	0.53	0.0057
Capped Slimes	4,093	2.6	8.2 (4.7)	0.70	0.0097
Covered Slimes	4,952	4.9	12.3 (8.8)	1.32	0.015
Covered Tailings	1,275	1.3	5.8 (2.3)	0.35	0.0060
Site Average		2.8	8.5 (5.0)	0.82	0.010

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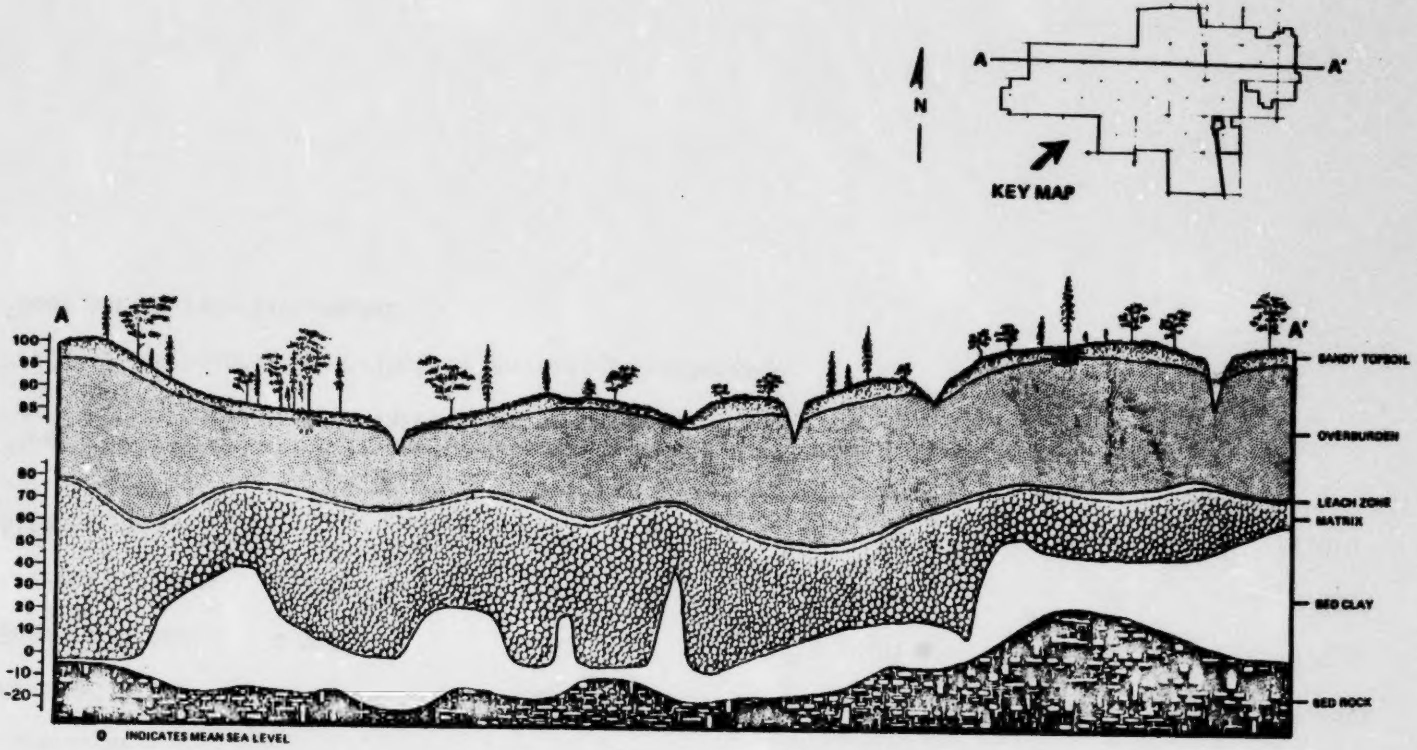
[a] Approximately 400 acres of lakes excluded. This is a conservative assumption because radioactive releases from lakes are near zero.

[b] External terrestrial contribution given in parentheses.

[c] Does not include background.



N
A
A'
KEY MAP
100
95
90
85
80
70
60
50
40
30
20
10
0
-10
-20
SANDY TOPSOIL
OVERBURDEN
LEACH ZONE
MATRIX
BED CLAY
BED ROCK
0 INDICATES MEAN SEA LEVEL

Note: Vertical scale in feet. Scale expanded between 80 and 85 feet.

Source: MCC, 1977.

Figure 3.6-1. Subsurface Structure of the MCC Site.

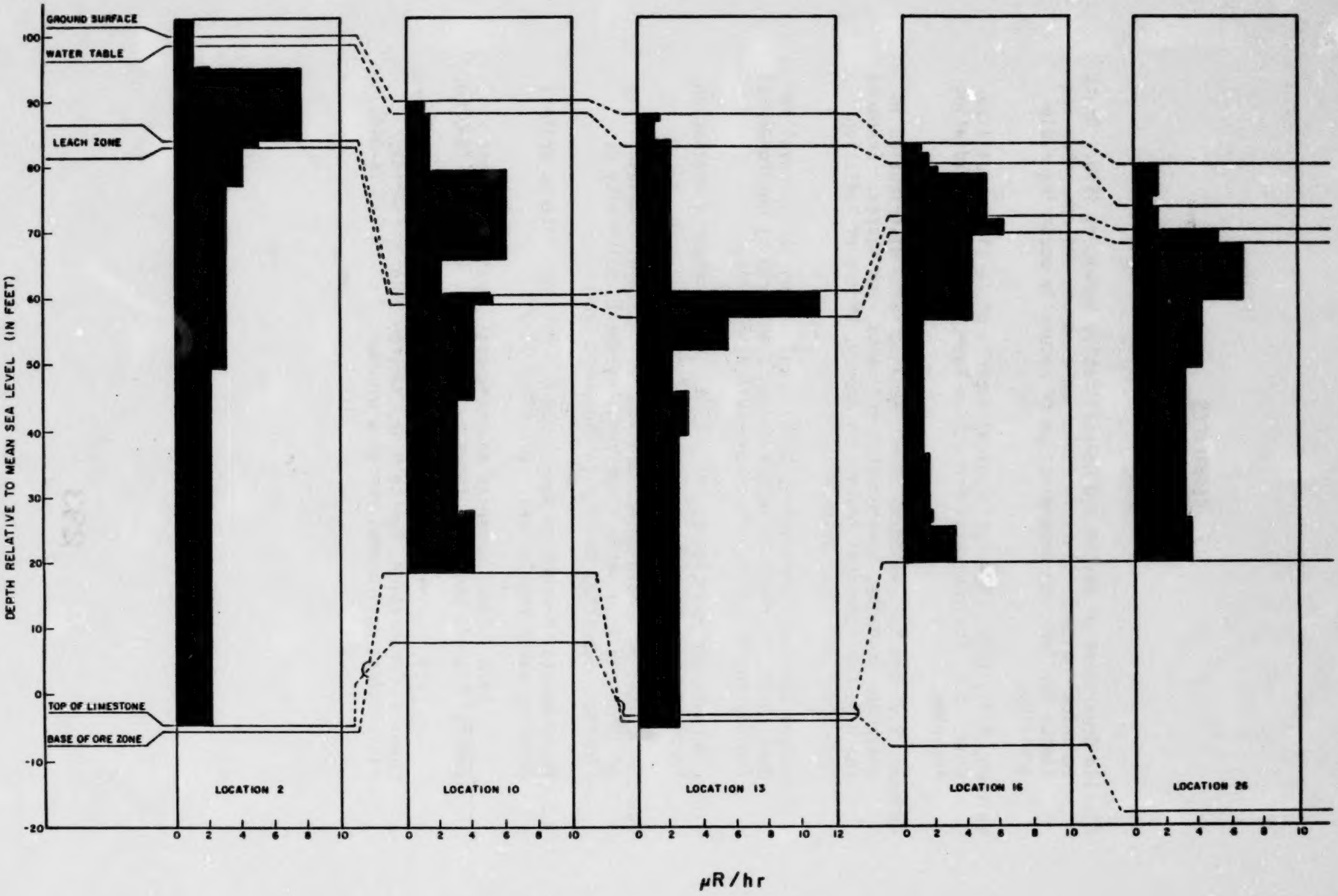


Figure 3.6-2. Direct Gamma Radiation (μR/hr) in Composite Soil Cores.

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4.0 OTHER NEPA CONSIDERATIONS (MCC'S PROPOSED ACTION)

4.1 UNAVOIDABLE ADVERSE IMPACTS

Discussed below is a brief summary of the adverse environmental impacts which cannot be avoided by any practical means during the construction and operation of the MCC phosphate mining project. Except as noted, these impacts are considered to be minor or negligible.

4.1.1 Geology/Soils

Modification of Soils

Approximately 10,700 acres of land would be mined or used for waste disposal. Existing soils would be displaced by soils having the following composition: sand/clay mixture in the ratio 2:1 (4,093 acres), clay slimes with partial sand tailings/overburden cap (4,952 acres), sand tailings with partial overburden cap (1,677 acres).

Topography

Approximately 2,176 acres of land would be raised to a final (as settled) elevation approximately 40 to 45 feet above-grade; an additional 1,447 acres would have a final elevation of 25 feet above-grade. All other portions of the site would remain at, or be returned to, approximately original grade.

4.1.2 Surface Water Resources

Reduction of Streamflow

During mining, certain parcels of land would be periodically removed from the natural drainage. Flow would be reduced in streams tributary to such areas during these periods. Rain falling into the open pits, clay storage areas, and tailings disposal ponds would also be occluded from streamflow during the active mining phase.

Diversion of Streamflow

Surface water in excess of 3.25 cfs would be diverted from Brushy Creek to an offstream storage basin to provide part of the make-up water needed for mining operations. The total diversion represents a 26 percent reduction of the average natural flow of Brushy Creek at the point where it exits the mine site property.

Effluent Discharge

Discharges to Oak Creek could occur at certain times of the year as a result of overflow from the clear water pond. Rain falling onto open mine pits, clay storage areas, the clear water pond, and plant site runoff would all contribute to the overflow.

Local Water Quality Degradation

Sediment from parcels of land cleared of vegetation could result in local water quality degradation. The sediment would result in an increase in turbidity and solids deposition into the streams receiving mine site drainage. Clear water pond effluent may cause exceedance of stream water quality standards for specific conductivity and for oil and grease. Local water quality changes could also occur as a result of seepage from clay settling areas; degradation of water quality could result from accidental spillage of waste clays due to the rupture of a clay slurry pipeline at a location near a stream, or a possible clay storage embankment failure.

4.1.3 Ground Water Resources

Withdrawal and Consumptive Use

Ground water withdrawals from the lower unit of the Floridan aquifer would lower potentiometric levels in the aquifer near the pumping wells. As these drawdown levels are relatively small, the potentiometric surface within the lower unit of the Floridan aquifer would not be significantly affected. Approximately 14,084,640 gpd of the total make-up water required for the project would be consumptively used and not returned to the hydrogeologic system. Since the consumptive use is less than the excess annual precipitation, the withdrawals should not result in a long-term negative effect on water quantities at the site.

Ground water withdrawals from the upper unit of the Floridan aquifer for potable and pump seal uses are projected to be 430,080 gpd;

these withdrawals would not adversely stress the upper Floridan aquifer or the shallow aquifer.

Mine Dewatering Impacts

As a result of dewatering mine pits, shallow aquifer water levels would be lowered in the vicinity of mine cuts. The impacts from mine cut dewatering would be temporary and local.

4.1.4 Terrestrial Biology

Approximately 8,182 acres of upland habitats on the MCC property would be directly affected due to mining, waste disposal, and facility construction. Flora and fauna of the site would be affected due to the temporary dewatering activities, loss of habitat due to mining activities, and activities related to mining such as construction of site roads.

4.1.5 Wetlands and Aquatic Habitat

The proposed mining activities would directly affect 2,540 acres of existing fresh water swamps and marshes and four miles of 5 cfs stream beds. There would be consequent significant declines in biota, changes in hydrology and/or deterioration of water quality, and stress on adjacent communities for fauna already existing on the site. Dewatering would also produce additional stresses upon the site's plant and animal communities.

The diversion of stream flow into new channels prior to mining would enable relocation of the majority of fish and mobile benthic forms, but non-mobile benthic forms would be destroyed. The isolation of stream pockets created after flow diversion would create additional loss of fish and benthos. Runoff water would transport suspended solids from erosion into the aquatic habitats on the site. This siltation would have short-term adverse effects, such as reduction of light penetration and lowered photosynthesis, smothering of benthic organisms, destruction of spawning areas, and abrasion and clogging of fish gills.

4.1.6 Threatened or Endangered Species

Unavoidable adverse impacts on several federally or state-listed threatened or endangered species might occur as a result of habitat loss and/or disturbance from mining activities.

4.1.7 Air Resources

Mining and beneficiation would result in an unavoidable increase in particulate and SO_2 emissions at the mine site. There would be some degradation of air quality locally, but all air quality standards would be met. Increases in fluoride deposition would not be sufficient to cause any harm to vegetation or water supplies. No health or aesthetic impacts would result from the expected emissions.

4.1.8 Socioeconomics

A slight increase in traffic levels on local roads and highways is expected to occur due to the mining activities. No adverse social or economic impacts are expected from the project.

4.1.9 Land Use

There are approximately 14,850 acres of land on the MCC site. The total acreage to be mined and/or used for waste disposal is anticipated to be about 10,700 acres. This land would later be reclaimed for similar or higher uses than at present; therefore, loss of land is only temporary.

4.1.10 Historic and Archeologic Resources

The archeological and historical sites identified on the MCC tract would be altered during mining operations to the extent that the value of the sites would be lost. The findings of the archeological survey indicate that only one site may warrant preservation. This specific site is being considered for excavation or intensive testing to recover archeological data prior to mining.

4.1.11 Noise

Noise contributions from mining operations would be considered an unavoidable adverse impact. Noise levels at the site boundary are expected to be below the USEPA suggested short-term goal for residential areas.

4.1.12 Radiology

Individual and population dose commitments would increase in an amount which would not be distinguishable from background exposures. After reclamation, clay slimes disposal sites on the MCC mine site might emit sufficient radioactivity to exceed indoor radon daughter working levels proposed by the USEPA. If measurements confirmed this, there would be a necessity for either special precautions prior to constructing residences on such lands (such as topsoil addition), or of zoning to exclude residential construction.

4.2 RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

4.2.1 Land Use

4.2.1.1 Long-Term Pre-Emptive Use of Land

The proposed mining project would utilize a site comprising about 14,850 acres in Hardee County, Florida for a period of 31 years. About 28 percent of this area would be left in its present state. Cattle grazing, the predominant land use on the MCC property, probably would continue to the year 2000. Reclaimed land would be restored to agricultural purposes, or to wetlands, as the mining project proceeds. At the completion of mining activities, the entire site area would be suitable for development due to continued reclamation activities as mining proceeded; at that time, the land could be utilized once again for agricultural purposes.

4.2.1.2 Regional Significance of Pre-Emptive Land Use

The 14,850 acre site required by MCC represents almost 4 percent of Hardee County's total land area. Land in Hardee County is used primarily for agricultural purposes. More than 75 percent of the county is in citrus, pasture, rangeland, and cropland, while only about 1 percent of the county is urbanized. Since the MCC site is less than 4 percent of the total land area in Hardee County, the developed pre-emptive land use for mining activities is not expected to have any measurable short-term effect on land availability or use in Hardee County. As indicated above, the reclaimed land would be available for virtually the same uses as at present, with the exception that reclaimed clay storage areas might not be suitable for building construction.

4.2.2 Water Use

4.2.2.1 Use of Ground Water

During the first three years of mining, water withdrawal would be from the Floridan aquifer; total withdrawal is limited to 16,981,920 gallons per day (gpd) on an annual average basis and 34,280,000 gpd on a maximum daily basis. After the first three years, surface water would be withdrawn to reduce ground water withdrawals: surface waters from Brushy Creek Basin would supply 5,086,000 gpd, and the Floridan aquifer would supply 12,324,000 gpd, both on an annual average basis.

Ground water use due to mining operations is expected to have only a slight effect on nearby wells. The maximum drawdown at the site boundaries is projected to be about 3.3 feet. As a result, the potentiometric surface in the lower unit of the Floridan aquifer would not be significantly affected by mining operations. Pumping tests showed that the water levels in the upper unit of the Floridan aquifer and shallow water table aquifer were not affected by production withdrawals. The slight drawdown effects at the property boundary would be incurred only during the life of the mining operations. No permanent change in the aquifer is expected.

4.2.2.2 Use of Surface Water

During mining operations, surface water would be diverted from Brushy Creek to reduce ground water withdrawals. Surface water would be diverted to Brushy Creek Reservoir, which would be in operation by the fourth year of mining. Surface water from Brushy Creek Basin would supply 5,086,000 gpd on an annual average basis. The results of a simulation analysis showed a 26 percent reduction of the natural average flow of Brushy Creek at the point where it exits the mine site property. Minimum average flow rates have been established by SWFWMD for each month of the year; withdrawals could not reduce flows below these levels.

4.2.2.3 Consumptive Use of Water Resources

Approximately 14,084,640 gpd of the total make-up water required for the project would be consumptively used (entrapped in clay wastes, sand tailings and product) and not returned to the hydrogeologic system. The consumptive use is approximately 96 percent of the excess annual precipitation (water crop) falling on the site. The water withdrawals should not result in a long-term negative effect on water quantities at the site since the consumptive use is less than the water crop.

4.2.3 Use of Air Resources

During the period of plant construction and phosphate matrix mining and beneficiation, there would be increased emissions of gases and particulates to the atmosphere. These emissions and the resulting ambient concentrations would not exceed established state or federal standards. At the conclusion of mining operations, emissions would cease, and no long-term effect on atmospheric resources is projected to occur.

4.2.4 Energy Use

The project would require energy for construction, mining, product transport, land reclamation, and other purposes throughout its duration. These expenditures are estimated in Section 4.3. The energy utilized would not be retrievable and would represent a diminution of resources available for future use.

4.2.5 Biology

Mining of the phosphate reserves on MCC land in Hardee County would result in the displacement and loss of numerous plant, animal, and avian species from the project boundaries. As mining would take place gradually over the plant lifetime, and reclamation would be initiated as soon as parcels of land were no longer needed for mining or waste disposal, a substantial population of various species would remain on the site throughout the project lifetime. Following reclamation, it is expected that habitats could support basically the same types and numbers of biological species as at present. It is possible, however, that certain threatened or endangered species would not repopulate the area because of limited reproducing populations in the area.

4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

It is anticipated that mining on the MCC tract would remove 94.5×10^6 tons of phosphate rock during 31.5 years of mining activities. On a yearly basis, 3×10^6 tons per year of phosphate rock would be mined. Associated with the removal of the phosphate rock would be removal of uranium. Uranium on site comprises 75 ppm of phosphate ore; therefore, it is projected that 1.26 tons of uranium would be removed during project lifetime mining activities. The phosphate rock would be processed for useful purposes, but all of the uranium resource would be lost except that which was recovered from the phosphoric acid plants.

Another irretrievable loss would be the consumption of electricity and fuels for mining and beneficiation purposes. The two draglines would require 230.4×10^6 KWH/hr or 7.26×10^9 KWH consumed over the life of the mine. The electricity demands of the phosphate grinder, rock dryer, and handling systems are projected to be 40.0×10^6 KWH/yr or 1.26×10^9 KWH consumed over the life of the plant. The rock dryer would also consumptively use fuel oil at 223,000 bbl/yr or 7.02 million barrels over the life of the plant. Other major uses of fuel oil would be for product transport to the chemical plants. Assuming all the beneficiated rock were transported a distance equivalent to that between the mine and Pascagoula, Mississippi, fuel oil consumption would be 11.7 million barrels. The consumption of the fuel oil and the fossil fuel necessary to generate the electricity required for the two draglines and the rock dryer would constitute an irreversible and irretrievable commitment of resources.

Chemical consumption associated with processing the phosphate ore for fertilizer, sulfur, and ammonia would also represent irretrievable commitments of resources. The table below indicates estimated consumption of various chemicals per year and for the life of the mine.

Chemical	Per Year	Life of Mine
Fuel oil and kerosene	14,700 tons	463,050 tons
Caustic soda	3,000 tons	94,500 tons
Tall oil (flotation)	5,700 tons	179,550 tons
Sulfuric acid	6,000 tons	189,000 tons
Amine	750 tons	23,625 tons
Diesel fuel (dike construction and reclamation)	2.3×10^6 gal/yr	72.5×10^6 gal

Consumptive water use for the project is estimated at 14,084,640 gpd. This is equivalent to 5.14×10^9 gallons per year, or 161.9×10^9 gallons during the project lifetime.

Mining of the MCC tract would limit future land use options to some degree, even after reclamation requirements were fulfilled. The MCC property encompasses 14,850 acres. The designated acreage that would be used in mining and clay storage is 10,722 acres. After reclamation, 8,182 acres would be restored to uplands, and 2,010 acres would be reclaimed as wetlands. There would be a 530-acre loss in wetlands on the MCC tract. Reclaimed clay storage lands (up to 3,700 acres) would probably be restricted to agricultural land uses due to limits imposed from overburden pressures.

Archeological sites on the MCC tract would be altered or destroyed by mining activities. The artifacts may be recovered from the one site considered for excavation or intensive testing before mining is begun.

4.4 CONFLICTS BETWEEN MCC'S PROPOSED ACTION AND THE OBJECTIVES OF FEDERAL, REGIONAL, STATE, AND LOCAL PLANS

Applicable permits, approvals, and plans with which the proposed action is or may potentially be in conflict are described below. Although the MCC proposed action is not in apparent conflict with many of the permits and approvals which are listed, they were included in the discussion for the sake of completeness.

4.4.1 Federal

4.4.1.1 Central Florida Phosphate Industry Areawide EIS Recommendations

The Final Areawide Environmental Impact Statement for the Central Florida Phosphate Industry published by the USEPA in November 1978 evaluated the impact of various alternative scenarios of phosphate mining in central Florida. The USEPA recommendations represent a generalized scenario of phosphate development which was determined to be as compatible as practicable with other desired and intended land uses. This document provides a basis for comparison and evaluation of new source phosphate mines in central Florida.

The following discussion compares the proposed activity with the USEPA recommendations for mining and beneficiation. The FEIS recommendations and clarifying statements are italicized and are followed by a description of the proposed activity.

- *Eliminate the rock-drying processing at beneficiation plants and transport wet (6- 20 percent moisture) rock to chemical plants.*

  Only rock to be utilized in triple superphosphate, elemental phosphorus, defluorinated rock feed, or other fertilizer processes requiring dry rock would be dried - and this would occur at the chemical processing complex or at dryers permitted by DER prior to publication of the DEIS. A possible exception on a case-by-case basis could be made for rock to be shipped outside of Florida for chemical processing; if the energy for *transporting the moisture were greater than the energy saved by eliminating drying, drying at the beneficiation plant would be considered if air quality (including radiation) could be adequately protected.*

MCC proposes to construct and operate a rock dryer at the Hardee County mine. The rock dryer would be capable of drying all of the rock produced. The planned mode of operation would be to dry all of the rock shipped to MCC's Pascagoula plant (1 million tons annually) and as much of the other 2 million tons produced per year as was required. MCC would seek customers for wet rock so that a minimum amount of rock could be dried at the site.

The proposed drying facility is made necessary by MCC's need for dry rock and by market conditions. Total acceptance of wet rock as the basic form of the phosphate rock commodity on the world market is not expected for some time. Many users have small phosphoric acid plants, and the designs vary widely. This situation makes conversion to wet rock not only expensive, but technically difficult. Conversion to wet rock also requires installation of wet rock grinding capacity in addition to major wet phosphoric acid process design changes. Significantly, capital for the modification is not readily available in many developing countries.

Some dry rock is used to produce triple superphosphate (TSP); there is no wet rock process for the production of TSP. If drying at the acid plant were required, small dryers would likely be installed at the individual locations. The small dryers would be inefficient and very expensive compared to the large units used by rock producers.

Given the present state of demand for phosphate rock, shipment of wet rock from MCC's Hardee County mine would be both the most costly (in terms of total system costs) and most energy intensive alternative. As a comparison, investment savings realized by MCC with onsite rock drying would be $10 to $20 million, compared to wet rock shipment from the mine; annual operating cost savings are expected to be between $2 and $5 million. A similar comparison of energy use indicates an annual savings of 13,000 barrels of No. 6 fuel oil (equivalent) compared to drying the rock at Pascagoula and 110,000 barrels compared to processing wet rock into fertilizer. When a sufficient market demand for wet rock developed (i.e., wet rock processing capacity at chemical plants), elimination of drying would become the most economical and energy efficient alternative.

Since the Areawide EIS study was undertaken, important study assumptions relative to air quality were changed by a significant action of the United States Congress. The Clean Air Act Amendments of 1977 require the application of Best Available Control Technology (BACT) to all significant sources and source modifications which have the potential to deteriorate air quality. The recommendation to eliminate rock drying in the Areawide EIS was based upon greater allowable source emission rates than are now permitted by USEPA Prevention of Significant Deterioration (PSD) regulations promulgated under the 1977 Amendments. For example, study assumptions for particulate matter were limited by allowable emission rates as provided for in the Florida Administrative Code (FAC 17-2.05,2, Process Weight Table). This rule permitted particulate emissions at least twice as great as those allowed under the PSD Regulations. A conclusion of the Areawide EIS proposed action was that the phosphate industry pollutant contribution would remain relatively constant after 1977. However, the PSD regulations suggest that the contribution should decrease as new processing facilities are constructed and older, less efficient control systems are replaced with new technology.

By establishing maximum increments of allowable deterioration, the PSD regulations effectively restrict availability of the air resource. Once the available resource is consumed by competing interests, no significant additional source effect can be permitted without a corresponding reduction in effect from another source.

Thus, under present PSD regulations, the objective of the Areawide EIS to protect air quality would be attained by an enforceable and pervasive system of air quality controls that exerts influence over all major industrial source contributions. The rock dryers proposed for the MCC facility would utilize wet contact scrubbers to reduce emissions of particulate matter and sulfur dioxide to levels well below state and federal standards. The application of BACT would also minimize the pollutant concentration levels of airborne radiation. As a result, all applicable air quality standards and PSD increments would be met by the proposed facility.

° *Meet state of Florida and local effluent limitations for any discharges.*

Pursuant to Section 401 of the Federal Water Pollution Control Act as amended (33 USC 1251, 1341), the State of Florida issues certification to each applicant for a National Pollutant Discharge Elimination System permit.

All recent NPDES permits issued by the state for phosphate mining facilities have been certified subject to the following conditions:

1. The applicant must comply with all applicable requirements of Chapter 403, Florida Statutes and Chapter 17 series, Florida Administrative Code (FAC).
2. Issuance of certification does not constitute state certification of any future land alteration activities which require other federal permits pursuant to Section 404 of P.L. 92-500, as amended, nor does it constitute approval or disapproval of any future land alteration activities conducted in waters of the state which require separate department permit(s)) pursuant to Section 17-4.28, FAC.
3. In accordance with Section 17-6.01(2)(a)2a.D., FAC, the following effluent limitations apply to all discharges designated as possibly containing contaminated runoff, process generated wastewater, or mine dewatering discharges from the mining and beneficiation of phosphate rock:

Characteristic	Discharge Limitations		Monitoring Requirements
	1-Day Max	30-Day Avg	
TSS (mg/l)	60	30	1/week/24-hr composite
Total Fixed Solids	25	12	1/week/24-hr composite
Total P (mg/l)	5	3	1/week/24-hr composite
pH	6.0-9.0	6.0-9.0	1/week grab

If the above requirements are met, the discharge from this facility would comply with Sections 301, 302, and 303 of the Federal Water Pollution Control Act, as amended.

The Florida Department of Environmental Regulation reserves the right to modify the effluent limitations placed on each facility pursuant to federal and state law. Modifications may occur should further water quality analysis of the proposed discharge, its volume, and character, together with the flow and characteristics of the receiving body of water, indicate that the discharge would not meet and comply with applicable water quality standards contained in Chapter 17-3, Florida Administrative Code.

Effluent limits and any additional requirements specified in the state certification supersede any less stringent effluent limits in the NPDES permit. During any time period in which more stringent state certification effluent limits are stayed or inoperable, the effluent limits listed in the NPDES permit will be in effect and fully enforceable.

MCC's proposed clear water pond effluent is expected to meet all of these discharge limitations.

- *Eliminate conventional aboveground slime-disposal areas.*

  The mining and reclamation plan for new source mines should establish a method whereby the slimes (or slimes/tailings mixture) would be used for reclamation or some other purpose. The need for an initial aboveground storage area is recognized -

> *as is the need for small retaining dikes around certain areas reclaimed with a slimes/tailings mixture. If the percentage of waste clay at a mine exceeds the proportionate amount that can be utilized, the incremental amounts beyond that which can be handled by new slime-dewatering methods may be placed in a holding pond for reclamation after adequate settling.*

MCC has determined that the sand to clay ratio at the site is insufficient to allow complete sand/clay mix waste disposal. In their mine plan, MCC has instead committed to use a modification of the conventional aboveground waste disposal method. The modification consists of stage-filling the clay disposal areas to obtain increased settling, followed by placement of an approximately 4-foot thick sand/clay cap with a ratio of approximately eight parts sand to one part clay. Sand tailings would be used for capping, backfill, and dike construction. Tailings disposal areas would be covered with a partial overburden cap.

As a result of this method, aboveground storage would be limited to approximately 3,700 acres. Approximately 60 percent of this area would have a final elevation 40 to 45 feet above grade; the remainder would be 25 feet above grade. Only approximately 400 acres of lakes would be created by this disposal/reclamation method.

> ° *Meet Southwest Florida Water Management District consumptive-use permit requirements.*

Withdrawals of ground water from the Floridan aquifer would be limited to those rates and locations specified in the Consumptive Use Permit (No. 27703567) granted by the Southwest Florida Water Management District (SWFWMD) on May 4, 1977.

The permit includes details of well location and pumping rates in the deep ground water system and places restrictions upon effects in both the shallow and deep ground water systems. The permit also specifies an annual average limitation on surface water withdrawals from Brushy Creek, as a supplement for ground water withdrawal beginning in the fourth year of mine operation. Specific minimum average monthly flows of water in Brushy Creek are set. MCC would not be allowed to withdraw surface water when flows fell below the specified minimum.

MCC is obligated to the terms and conditions of the Consumptive Use Permit. Should MCC fail to comply with all of the conditions set forth in the permit, then the permit would automatically become null and void.

- *Provide storage that allows recirculation of water recovered from slimes.*

  Storage capacity is to be determined during the pending DRI and/or site-specific EIS based on local hydrologic characteristics. The designed storage capacity should allow for capture of 100 percent of water recovered from slimes for reuse.

A total of 147.06 million gallons per day (mgd) of water would enter the clay settling areas in the slurry pipeline; an additional 1.75 mgd (average) would be contributed by excess rainfall. Of this amount, 1.24 mgd would be lost to seepage, and 16.85 mgd would be lost to evaporation and clay absorption, leaving 130.72 mgd for return to the clear water pond. An additional 8.79 mgd would be captured in the clear water pond from product and non-clay waste storage. During most time periods, 100 percent of this water would be returned to the process system. However, during high rainfall periods, some overflow would occur; on a long-term average, the effluent discharge is estimated to be 2.31 mgd, so that the recovery rate would be 98.3 percent.

- *Use connector wells.*

  Such wells offer an economical means of dewatering the shallow ground water from the water table aquifer before mining, while replenishing a portion of the water pumped from the Floridan Aquifer for the purposes of transportation and beneficiation. Mining plans for new-source mines can continue to utilize this method of dewatering - but only with the following precautionary measures: maximum utilization of water obtained from *dewatering; monitoring by both industry and regulatory agencies to assure that the drained water meets recommended drinking water criteria chemically, bacteriologically, and radiologically at all times; and assurance that wells will be adequately cemented and grouted before being abandoned.*

MCC does not plan to use connector wells for recharge of the underlying artesian Floridan aquifer. Only one relatively small 200 acres) portion of the MCC site has a high enough transmissivity in the surficial aquifer to make such a recharge program feasible. This area could provide only 125 to 200 gpm (0.18 to 0.29 mgd) of recharge water (P.E. LaMoreaux & Associates, 1977). Instead, MCC plans to supplement Floridan aquifer withdrawals by collection of excess rainfall and by utilization of a portion (26 percent of annual average) of the surface water flow in Brushy Creek.

- *Address proposed regulations regarding radiation levels to be published by EPA and projected by mining and reclamation plans for new source mines based on test borings of material to be encountered. The DRI and/or site-specific EIS should also develop a reclamation plan that considers radiation of spoil material and reduces as much as possible the amount of radionuclide-bearing material left within 3-4 feet of the surface.*

The projected indoor radon daughter working levels (WL) by land type for the MCC mine after reclamation are as follows: undisturbed overburden, 0.0057 WL; capped slimes, 0.0097 WL; covered slimes, 0.015 WL; covered tailings, 0.006 WL; and the weighted site average, 0.010 WL. Using a background level of 0.009 WL (normal background of 0.004 WL plus the uncertainty of 0.005 WL), portions of the MCC site might exceed the limit of 0.020 WL proposed by the USEPA (1979). MCC's proposal to utilize sand/clay caps for waste disposal and to maximize the reclamation of at-grade land yields predicted working levels below the USEPA standards on all but reclaimed slime areas (which are not suitable for building foundations). If future development plans call for development of these reclaimed slime areas, site measurements would be warranted to determine whether topsoil should be placed on that portion of the site.

- *Meet county and state reclamation requirements and include in the DRI and/or site-specific EIS an inventory of types of wildlife habitat in the area to be mined and the area immediately surrounding it.*

and

- *The mining and reclamation plan will take into account the protection and restoration of habitat so selected important species of wildlife will be adequately protected during mining and reclamation.*

Wildife habitats, with their associated fauna and flora, are described in detail in the Biology Technical Support Document (TSD II) and summarized in Section 3.3 of the DEIS. A total of 2,540 acres of wetlands would be affected by the proposed action; 2,010 acres are planned to be reclaimed. Of the upland habitats on the site, 9,825 acres would be affected; all of this area would be reclaimed as pasture land except that which was used for aboveground structures. Approximately 440 acres of wetlands and 2,045 acres of uplands, including 12 of the 30 acres of unique xeric hammock, would be unaffected by mining activities. Mining and reclamation would be undertaken in stages.

County and state reclamation requirements, specifically those of the Hardee County Board of Commissioners and the Florida Department of Veterans and Community Affairs (formerly the Division of State Planning) of the Bureau of Land and Water Management, would be met by the proposed plan of action through the Florida Development Order which was approved on March 17, 1981. The Development Order provides for conditional preservation of certain hardwood swamps and fresh marshes, which may be mined following the presentation of satisfactory evidence to support the feasibility of restoration of these wetlands.

The Development Order also states that the proposed MCC development is consistent with all local and state land development laws and regulations.

- *Protect or restore wetlands under the jurisdiction of the Corps of Engineers, Section 404, Federal Water Pollution Control Act, pursuant to 404(b) Guidelines (40 CFR 230).*

Wetlands on the MCC site subject to the Corps of Engineers' regulatory authority will be defined and effects upon the public interest from actions proposed within said wetlands will be evaluated relative to the need to perform the actions within wetlands. Evaluation of effects of proposed work will include the following considerations:

a. Wetlands, regardless of USEPA categorizations as 1, 2, or 3, will be evaluated with regard to their importance functions, such as providing terrestrial or aquatic wildlife habitat; primary and secondary production; surface and ground water pattern alteration, including aquifer recharge and storm and flood water storage; and water quality maintenance.

b. The necessity of locating proposed works in importantly functioning wetlands in order to fulfill the primary purpose of mining phosphate and/or supporting mining.

c. The feasibility of locating proposed mining works in places other than in importantly functioning wetlands.

Public interest benefits of potentially affected wetlands and those of proposed and alternative actions will be evaluated from the perspectives of conservation, economics, aesthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use, navigation, recreation, water supply, water quality, energy needs, safety, food production, and the general needs and welfare of the people. These evaluations will be synthesized by considering the extent and permanence of the work, public and private needs for the work or its alternatives, and the cumulative effects of alternative actions on existing and anticipated uses of the site. Authorization of any action by the Corps of Engineers would be made only if:

a. Identified benefits of the action were determined to exceed anticipated damages to wetland resources, and

b. The action was determined to be necessary to realize identified benefits to the public interest.

- *Three categories of wetlands are to be established in the Mining/Reclamation Plan for New Source Mines for regulation. Category 1, which are to be protected, includes wetlands within and contiguous to rivers and streams having an average annual flow exceeding 5 cubic feet per second as well as other specific wetlands determined to serve essential environmental functions, including water quality. (These are wetlands that provide an essential synergistic support to the ecosystem and that would have an unacceptable adverse impact if they were altered, modified, or destroyed.) This generally includes cypress swamps, swamp forests, wet prairies, and certain freshwater marshes. Category 2 includes wetlands that should be restored as wetlands to perform useful wetland functions. This also includes certain isolated noncategory wetlands that serve a primary function or several minor functions that may be maintained through proper restoration. Category 3 includes wetlands that would not have to be restored as wetlands. These are isolated and normally intermittent in nature, have less significant hydrological functions than Category 2, and minimal life-support value.*

The definitions of wetlands categories were presented in the Areawide EIS as general guidelines to rank natural wetlands on Florida phosphate mining sites in terms of their value to regional hydrology, water quality, and fish and wildlife production. This categorization scheme was intended to aid in the USEPA review process of proposed mining/reclamation plans for new source mines.

Four alternative preservation schemes were considered for the MCC site. The three categories of wetlands, as defined strictly by the Areawide EIS, are shown on Figures 2.10-2, 2.10-3, and 2.10-4. These total 1,060 acres in Category 1, 1,538 acres in Category 2, and 382 acres in Category 3.

A second preservation scheme was developed by applying the USEPA wetlands definitions as criteria for a site-specific wetland categorization, preserving wetlands with only high functional and/or habitat value. Figure 2.10-5 shows the Category 1 wetlands as defined under this scheme; a total of 233 acres would be preserved. Category 2 wetlands comprise 2,358 acres and Category 3 wetlands cover 389 acres.

A third preservation scheme was based on the quality and diversity of ecological system functions and includes preservation of some non-wetlands where their ecological importance is high. Figure 2.10-6 shows the systems which would qualify for preservation under this scheme; they total 1,007 acres. Category 2 and 3 wetlands would comprise 1,871 acres and 389 acres, respectively.

The fourth preservation scheme is the proposed action and is the preservation plan outlined in the Florida Development Order. Protected wetlands total 233 acres, including 120 acres of swamp forest and 113 acres of marsh (Figure 2.10-1). These wetlands would be mined only when MCC demonstrated to the satisfaction of the USEPA, state, and Hardee County, that the wetlands could be restored with equivalent functional values. In addition to these conditional preserved wetlands, 270 acres of swamp forest and 1,507 acres of wetlands would be reclaimed as part of the proposed mining and reclamation plan.

- *Make efforts to preserve archeological or historical sites through avoidance or mitigate by salvage excavation performed by a professionally competent agency any sites deemed significant by the Florida Division of Archives, History, and Records Management. If mitigation is chosen, the resulting report* *should be submitted to that state agency for examination and comment.*

One archeological site of significance, Aboriginal Site No. 1, is a camp site representing the Lake Okeechobee Basin Belle Glade culture. This site has been recommended for excavation prior to mining. A request has been submitted to the Department of Interior for a determination of eligibility for the National Register. MCC's plans call for excavation under proper archeological supervision prior to mining disturbance.

4.4.1.2 Corps of Engineers Section 404 (Dredge and Fill Disposal) Permit

A permit is required from the Corps of Engineers for disposal of dredged or fill material in waters of the United States, including wetlands, subject to Corps jurisdiction. Section 404 permits are considered for authorization after public notice, opportunity for public comment, public hearing, consultation with other Federal agencies and with state and local agencies, and upon completion of a public interest review by the Corps. MCC must apply for and obtain such a permit and must comply with all conditions set forth therein. Preparation of this DEIS fulfills the environmental assessment requirements for the Section 404 permits.

4.4.1.3 NPDES Discharge Permit

The requirement for an NPDES permit to be issued by USEPA is the major federal action which has prompted the preparation of this DEIS.

4.4.1.4 PSD Permit

A PSD permit must be obtained by MCC prior to construction of major pollutant emitting facilities. This permit approval is separate and independent from the NPDES permit process which is the subject of this DEIS. A summary of predicted air quality impacts has been included in TSD-III and in Section 3.4 of this DEIS. The proposed project is expected to meet established PSD increment and BACT requirements.

4.4.2 State of Florida

4.4.2.1 Department of Environmental Regulation Construction Permit

DER must issue a separate construction permit before MCC may construct, expand, or modify any potential source of air pollution. After construction, an operating permit must be obtained. Applications for these permits would be processed simultaneously with the PSD permit.

4.4.2.2 Construction and Operation of Potential Sources of Water Pollution

DER must issue a permit for stationary point sources of water pollution prior to construction. These sources must meet specific effluent standards and instream water quality standards. As indicated in Section 4.4.1.1, the TSS in MCC's clear water pond discharge may exceed the 30-day average and 1-day maximum concentrations established by the state. Assuming complete mixing of the average effluent discharge with average ambient flows in Oak Creek during the period of June through September, comparisons were made with Florida standards (Section 3.2.1.2). The increase in specific conductance and the ambient concentration of oil and grease may occasionally exceed water quality standards as a result of the MCC effluent discharge.

4.4.2.3 Dredging and Filling

DER regulates dredging and filling activities in navigable waters of the state. A permit is required, similar to but separate from, that required from the Corps of Engineers. The wetlands jurisdiction of DER may be different from that of the Corps.

4.4.2.4 Consumptive Water Use

A consumptive use permit has been obtained from SWFWMD, as indicated in Section 4.4.1.1.

4.4.3 Hardee County

4.4.3.1 Zoning Regulations

On April 15, 1977, the Hardee County Board of County Commissioners approved a request by MCC that the site be rezoned from A-1 (agricultural) to M-1 (mining and earth moving).

4.4.3.2 Mining Ordinance

The Hardee County Mining Ordinance requires that no mining activities be conducted except when such land is zoned M-1. Also, application for a mining permit must include the Development of Regional Impact (DRI) application for development approval (ADA), a mining and reclamation master plan, copies of financial responsibility and any required zoning amendments. Approval of the Florida Development Order (FDO) constitutes approval by the Board of Commissioners that the provisions of the Mining Ordinance would be met by implementing the conditions in the FDO.

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Dames & Moore

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DRAFT ENVIRONMENTAL IMPACT STATEMENT COORDINATION LIST

The following federal, state, and local agencies, public officials, organization, and interest groups have been requested to comment on this impact statement.

Federal Agenices

Bureau of Mines
Coast Guard
Corps of Engineers
Council on Environmental Quality
Department of Agriculture
Department of Commerce
Department of Education
Department of the Interior
Department of Transportation
Department of Health and Human Services
Department of Housing and Urban Development
Department of Energy
Federal Highway Administration
Fish and Wildlife Service
Food and Drug Administration
Forest Service
Geological Survey
National Park Service
Economic Development Administration
Soil Conservation Service
Public Health Service

Members of Congress

Honorable Lawton Chiles
United States Senate

Honorable Sam Gibbons
U.S. House of Representatives

Honorable L.A. Bafalis
U.S. House of Representatives

Honorable Paula Hawkins
United States Senate

Honorable Andy P. Ireland
U.S. House of Representatives

State

Honorable D. Robert Graham, Governor
Coastal Coordinating Council
Department of Natural Resources
Department of Agriculture and Consumer Services
Department of Community Affairs
Geological Survey
Game and Freshwater Fish Commission
Department of State
Department of Commerce
Department of Health and Rehabilitative Services
Department of Environmental Regulation
Department of Transportation

Local and Regional

Polk County Commission
Manatee County Commission
DeSoto County Commission
Hardee County Commission
Hardee County Building & Zoning Department
Tampa Bay Regional Planning Council
Central Florida Regional Planning Council
Southwest Florida Water Management District

Interest Groups

The Fertilizer Institute
Florida Phosphate Council
Florida Audubon Society
Florida Sierra Club
Manasota 88
Florida Defenders of the Environment
Izaak Walton League of America
Florida Wildlife Federation

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Appendix A

Draft NPDES Permit

Permit No.: FL0037745

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et. seq; the "Act"),

Mississippi Chemical Corporation

is authorized to discharge from a facility located at

near the Vandolah Plant Site
Latitude - 27° 30' 10

Longitude - 81° 55' 59"

to receiving waters named

Oak Creek

DRAFT
AUG 17 1981

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. The permit consists of this cover sheet, Part I 2 pages(s), Part II 12 page(s) and Part III 4 page(s).

This permit shall become effective on

This permit and the authorization to discharge shall expire at midnight,

Date Signed

Howard D. Zeller
Acting Director
Enforcement Division

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the effective date of this permit and lasting through the term of this permit, the permittee is authorized to discharge from outfall(s) serial number(s)001-process generated wastewater.

Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations				Monitoring Requirements	
	kg/day (lbs/day)		Other Units (Specify)			
	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency (during discharge)	Sample Type
Flow–m³/Day (MGD)	—	—	—	—	Continuous	Recorder
Total Suspended Solids	--	--	30 mg/1	60 mg/1	1/week	Composite
Specific Conductance	--	--	550 µmhos/cm	900 µmhos/cm	1/week	Composite
Radium*	--	--	5pci/1	10pci/1	1/week	Composite

*Combined Radium 226 & 228

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored once per week with a grab sample.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): nearest accessible point after final treatment but prior to actual discharge or mixing with the receiving waters.

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Any overflow from facilities designated, constructed and maintained to contain or treat the volume of wastewater which would result from a "10-year, 24-hour precipitation event shall not be subject to the suspended solids limitation or the pH limitation listed on the preceeding pages. Monitoring and reporting shall be required for all other parameters.

The effluent limits and any additional requirements specified in the state certification supersede any less stringent effluent limits listed above. During any time period in which more stringent state certification effluent limits are stayed or inoperable, the effluent limits listed above shall be in effect and fully enforceable.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

   Operational Level Attained..................Effective Date of Permit

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A. MANAGEMENT REQUIREMENTS

1. Discharge Violations

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than, or at a level in excess of, that identified and authorized by this permit constitutes a violation of the terms and conditions of this permit. Such a violation may result in the imposition of civil and/or criminal penalties as provided in Section 309 of the Act.

2. Change in Discharge

Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application at least 180 days prior to commencement of such discharge. Any other activity which would constitute cause for modification or revocation and reissuance of this permit, as described in Part II (B) (4) of this permit, shall be reported to the Permit Issuing Authority.

3. Noncompliance Notification

a. Instances of noncompliance involving toxic or hazardous pollutants should be reported as outlined in Condition 3c. All other instances of noncompliance should be reported as described in Condition 3b.

b. If for any reason, the permittee does not comply with or will be unable to comply with any discharge limitation specified in the permit, the permittee shall provide the Permit Issuing Authority with the following information at the time when the next Discharge Monitoring Report is submitted.

   (1) A description of the discharge and cause of noncompliance;
   (2) The period of noncompliance, including exact dates and times and/or anticipated time when the discharge will return to compliance; and
   (3) Steps taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.

c. Toxic or hazardous discharges as defined below shall be reported by telephone within 24 hours after permittee becomes aware of the circumstances and followed up with information in writing as set forth in Condition 3b. within 5 days, unless this requirement is otherwise waived by the Permit Issuing Authority:

(1) Noncomplying discharges subject to any applicable toxic pollutant effluent standard under Section 307(a) of the Act;

(2) Discharges which could constitute a threat to human health, welfare or the environment. These include unusual or extraordinary discharges such as those which could result from bypasses, treatment failure or objectionable substances passing through the treatment plant. These include Section 311 pollutants or pollutants which could cause a threat to public drinking water supplies.

d. Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

4. Facilities Operation

All waste collection and treatment facilities shall be operated in a manner consistent with the following:

a. The facilities shall at all times be maintained in a good working order and operated as efficiently as possible. This includes but is not limited to effective performance based on design facility removals, adequate funding, effective management, adequate operator staffing and training, and adequate laboratory and process controls (including appropriate quality assurance procedures); and

b. Any maintenance of facilities, which might necessitate unavoidable interruption of operation and degradation of effluent quality, shall be scheduled during noncritical water quality periods and carried out in a manner approved by the Permit Issuing Authority.

c. The permittee, in order to maintain compliance with this permit shall control production and all discharges upon reduction, loss, or failure of the treatment facility until the facility is restored or an alternative method of treatment is provided.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to waters of the United States resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature of the noncomplying discharge.

6. **Bypassing**

"Bypassing" means the intentional diversion of untreated or partially treated wastes to waters of the United States from any portion of a treatment facility. Bypassing of wastewaters is prohibited unless all of the following conditions are met:

a. The bypass is unavoidable-i.e. required to prevent loss of life, personal injury or severe property damage;

b. There are no feasible alternatives such as use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down time;

c. The permittee reports (via telephone) to the Permit Issuing Authority any unanticipated bypass within 24 hours after becoming aware of it and follows up with written notification in 5 days. Where the necessity of a bypass is known (or should be known) in advance, prior notification shall be submitted to the Permit Issuing Authority for approval at least 10 days beforehand, if possible. All written notifications shall contain information as required in Part II (A)(3)(b); and

d. The bypass is allowed under conditions determined to be necessary by the Permit Issuing Authority to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration to the extent feasible.

This requirement is waived where infiltration/inflow analyses are scheduled to be performed as part of an Environmental Protection Agency facilities planning project.

7. **Removed Substances**

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering waters of the United States.

8. Power Failures

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failures either by means of alternate power sources, standby generators or retention of inadequately treated effluent. Should the treatment works not include the above capabilities at time of permit issuance, the permittee must furnish within six months to the Permit Issuing Authority, for approval, an implementation schedule for their installation, or documentation demonstrating that such measures are not necessary to prevent discharge of untreated or inadequately treated wastes. Such documentation shall include frequency and duration of power failures and an estimate of retention capacity of untreated effluent.

9. Onshore or Offshore Construction

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any waters of the United States.

B. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow the Permit Issuing Authority and/or authorized representatives (upon presentation of credentials and such other documents as may be required by law) to:

a. Enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit;

b. Have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit;

c. Inspect at reasonable times any monitoring equipment or monitoring method required in this permit;

d. Inspect at reasonable times any collection, treatment, pollution management or discharge facilities required under the permit; or

e. Sample at reasonable times any discharge of pollutants.

2. Transfer of Ownership or Control

A permit may be transferred to another party under the following conditions:

a. The permittee notifies the Permit Issuing Authority of the proposed transfer;

b. A written agreement is submitted to the Permit Issuing Authority containing the specific transfer date and acknowledgement that the existing permittee is responsible for violations up to that date and the new permittee liable thereafter.

Transfers are not effective if, within 30 days of receipt of proposal, the Permit Issuing Authority disagrees and notifies the current permitttee and the new permittee of the intent to modify, revoke and reissue, or terminate the permit and to require that a new application be filed.

3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Act, (33 U.S.C. 1318) all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Permit Issuing Authority. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act (33 U.S.C. 1319).

4. Permit Modification

After notice and opportunity for a hearing, this permit may be modified, terminated or revoked for cause (as described in 40 CFR 122.15 et seq) including, but not limited to, the following:

a. Violation of any terms or conditions of this permit;

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;

c. A change in any condition that requires either temporary interruption or elimination of the permitted discharge; or

d. Information newly acquired by the Agency indicating the discharge poses a threat to human health or welfare.

If the permittee believes that any past or planned activity would be cause for modification or revocation and reissuance under 40 CFR 122.15 et seq, the permittee must report such information to the Permit Issuing Authority. The submission of a new application may be required of the permittee.

5. Toxic Pollutants

   a. Notwithstanding Part II (B)(4) above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge authorized herein and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revoked and reissued or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

   b. An effluent standard established for a pollutant which is injurious to human health is effective and enforceable by the time set forth in the promulgated standard, even though this permit has not as yet been modified as outlined in Condition 5a.

6. Civil and Criminal Liability

   Except as provided in permit conditions on "Bypassing", Part II (A) (6), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. Oil and Hazardous Subatance Liability

   Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act (33 U.S.C. 1321).

8. State Laws

   Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. **Property Rights**

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

10. **Severability**

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

11. **Permit Continuation**

A new application shall be submitted at least 180 days before the expiration date of this permit. Where EPA is the Permit Issuing Authority, the terms and conditions of this permit are automatically continued in accordance with 40 CFR 122.5, provided that the permittee has submitted a timely and sufficient application for a renewal permit and the Permit Issuing Authority is unable through no fault of the permittee to issue a new permit before the expiration date.

C. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Reporting

Monitoring results obtained during each calendar month shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1). Forms shall be submitted at the end of each calendar quarter and shall be postmarked no later than the 28th day of the month following the end of the quarter. The first report is due by the 28th day of the month following the first full quarter after the effective date of this permit.

Signed copies of these, and all other reports required herein, shall be submitted to the Permit Issuing Authority at the following address(es):

Permit Compliance Branch
Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

3. Test Procedures

Test procedures for the analysis of pollutants shall conform to all regulations published pursuant to Section 304(h) of the Clean Water Act, as amended (40 CFR 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants").

4. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The person(s) who obtained the samples or measurements;

c. The dates the analyses were performed;

d. The person(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of all required analyses.

5. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

6. Records Retention

The permittee shall maintain records of all monitoring including: sampling dates and times, sampling methods used, persons obtaining samples or measurements, analyses dates and times, persons performing analyses, and results of analyses and measurements. Records shall be maintained for three years or longer if there is unresolved litigation or if requested by the Permit Issuing Authority.

D. DEFINITIONS

1. Permit Issuing Authority

The Regional Administrator of EPA Region IV or designee.

2. Act

"Act" means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act) Public Law 92-500, as amended by Public Law 95-217 and Public Law 95-576, 33 U.S.C. 1251 et seq.

3. Mass/Day Measurements

a. The "average monthly discharge" is defined as the total mass of all daily discharges sampled and/or measured during a calendar month on which daily discharges are sampled and measured, divided by the number of daily discharges sampled and/or measured during such month. It is, therefore, an arithmetic mean found by adding the weights of the pollutant found each day of the month and then dividing this sum by the number of days the tests were reported. This limitation is identified as "Daily Average" or "Monthly Average" in Part I of the permit and the average monthly discharge value is reported in the "Average" column under "Quantity" on the Discharge Monitoring Report (DMR).

b. The "average weekly discharge" is defined as the total mass of all daily discharges sampled and/or measured during a calendar week on which daily discharges are sampled and/or measured divided by the number of daily discharges sampled and/or measured during such week. It is, therefore, an arithmetic mean found by adding the weights of pollutants found each day of the week and then dividing this sum by the number of days the tests were reported. This limitation is identified as "Weekly Average" in Part I of the permit and the average weekly discharge value is reported in the "Maximum" column under "Quantity" on the DMR.

c. The "maximum daily discharge" is the total mass (weight) of a pollutant discharged during a calendar day. If only one sample is taken during any calendar day the weight of pollutant calculated from it is the "maximum daily discharge". This limitation is identified as "Daily Maximum," in Part I of the permit and the highest such value recorded during the reporting period is reported in the "Maximum" column under "Quantity" on the DMR.

4. Concentration Measurements

a. The "average monthly concentration," other than for fecal coliform bacteria, is the concentration of all daily discharges sampled and/or measured during a calendar month on which daily discharges are sampled and measured divided by the number of daily discharges sampled and/or measured during such month (arithmetic mean of the daily concentration values). The daily concentration value is equal to the concentration of a composite sample or in the case of grab samples is the arithmetic mean (weighted by flow value) of all the samples collected during that calendar day. The average monthly count for fecal coliform bacteria is the geometric mean of the counts for samples collected during a calendar month. This limitation is identified as "Monthly Average" or "Daily Average" under "Other Limits" in Part I of the permit and the average monthly concentration value is reported under the "Average" column under "Quality" on the DMR.

b. The "average weekly concentration," other than for fecal coliform bacteria, is the concentration of all daily discharges sampled and/or measured during a calendar week on which daily discharges are sampled and measured divided by the number of daily discharges sampled and/or measured during such week (arithmetic mean of the daily concentration values). The daily concentration value is equal to the concentration of a composite sample or in the case of grab samples is the arithmetic mean (weighted by flow value) of all samples collected during that calendar day. The average weekly count for fecal coliform bacteria is the geometric mean of the counts for samples collected during a calendar week. This limitation is identified as "Weekly Average" under "Other Limits" in Part I of the permit and the average weekly concentration value is reported under the "Maximum" column under "Quality" on the DMR.

c. The "maximum daily concentration" is the concentration of a pollutant discharged during a calendar day. It is identified as "Daily Maximum" under "Other Limits" in Part I of the permit and the highest such value recorded during the reporting period is reported under the "Maximum" column under "Quality" on the DMR.

5. Other Measurements

   a. The effluent flow expressed as M^3/day (MGD) is the 24 hour average flow averaged monthly. It is the arithmetic mean of the total daily flows recorded during the calendar month. Where monitoring requirements for flow are specified in Part I of the permit the flow rate values are reported in the "Average" column under "Quantity" on the DMR.

   b. Where monitoring requirements for pH, dissolved oxygen or fecal coliform are specified in Part I of the permit the values are generally reported in the "Quality or Concentration" column on the DMR.

6. Types of Samples

   a. Composite Sample - A "composite sample" is any of the following:

      (1) Not less than four influent or effluent portions collected at regular intervals over a period of 8 hours and composited in proportion to flow.

      (2) Not less than four equal volume influent or effluent portions collected over a period of 8 hours at intervals proportional to the flow.

      (3) An influent or effluent portion collected continuously over a period of 24 hours at a rate proportional to the flow.

   b. Grab Sample: A "grab sample" is a single influent or effluent portion which is not a composite sample. The sample(s) shall be collected at the period(s) most representative of the total discharge.

7. Calculation of Means

   a. Arithmetic Mean: The arithmetic mean of any set of values is the summation of the individual values divided by the number of individual values.

   b. Geometric Mean: The geometric mean of any set of values is the $N^{\underline{th}}$ root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

c. **Weighted by Flow Value:** Weighted by flow value means the summation of each concentration times its respective flow divided by the summation of the respective flows.

8. Calendar Day

   a. A calendar day is defined as the period from midnight of one day until midnight of the next day. However, for purposes of this permit, any consecutive 24-hour period that reasonably represents the calendar day may be used for sampling.

PART III

OTHER REQUIREMENTS

1. In accordance with Section 306(d) of the Federal Water Pollution Control Act (PL 92-500) the standards of performance for conventional Pollutions as contained in this permit shall not be made any more stringent during a ten year period beginning on the date of completion of construction or during the period of depreciation of amortization of such facility for the purposes of Section 167 or 169 (or both) of the Internal Revenue Code of 1954, whichever period ends first. The provisions of Section 306(d) do not limit the authority of the Environmental Protection Agency to modify the permit to require compliance with a toxic effluent limitation promulgated under BAT or Toxic Pollutant Standard established under Section 307(a) of the FWPCA.

National Environmental Policy Act Requirements

2.) The Permittee shall undertake a program as recommended by the U.S. Fish and Wildlife Service to avoid injuring or killing the eastern indigo snake. If this species is encountered during mining or related activities, the individual should be collected and safely removed from the area. MCC shall coordinate with the Florida Endangered Species Coordinator for the relocation of the individual.

To insure this program is acceptably implemented, MCC shall develop a program to familarize MCC employees with the characteristics of the species and in safe capture, handling, and holding procedures.

3.) Prior to commencement of mining related activities the Permittee shall undertake, as needed, consultations relative to significant onsite archaeological sites as specified in 36 CFR 800. Any excavation programs shall be approved by and conducted under the guidance of the State Historic Preservation Office.

4.) The Permittee shall preserve from mining and other disturbances those areas designated as Category I wetlands for the site (attached Figure I). If, in time, onsite wetland systems of an equally functional value as those currently onsite have been created, an MCC proposal to mine the preserved wetland areas would be reevaluated.

PART III

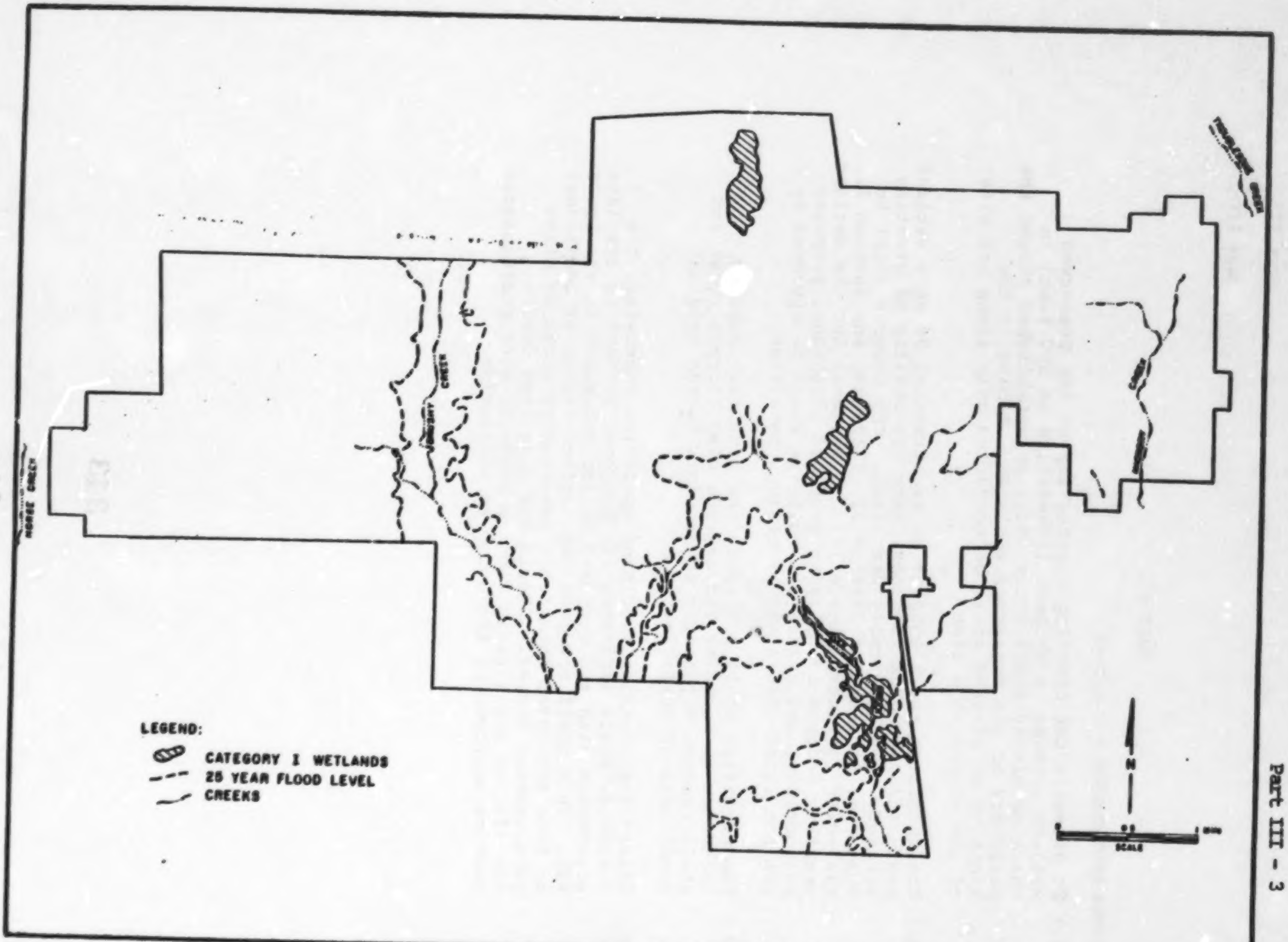
OTHER REQUIREMENTS - continued

5.) To preserve the hydrologic integrity of the preserved wetland systems, a setback (identified as 250 feet) in which no mining shall occur shall be established around the periphery of the preserved wetlands. Mining in the vicinity of streams shall be conducted only along one side of the stream at a time.

6.) The Permittee shall conduct an experimental 90 acre wetland restoration program to demonstrate the ability of creating wetlands in historically wet areas. The program shall be conducted in areas of Section 32, T34S-R24E and Section 31, T34S-R24E (attached Figure II). A protocol for the wetland creation program identifying proposed locations, proposed methodology, and evaluation criteria shall be approved by EPA not later than start of mining operations.

7.) The Permittee shall implement the sand/clay capping technique to minimize above-grade clay storage areas and shall restore topography to as close to the original conditions as possible.

8.) Unless a preceeding condition specifies otherwise, the Permittee shall implement its proposed project in complete accordance with the proposed action described in the Draft EIS. This shall not preclude implementation of additional or more stringent conditions required by local or state governmental bodies. Should the Permittee desire significant modification of the project, such modification must be approved by EPA prior to initiation.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CATEGORY I WETLANDS
25 YEAR FLOOD LEVEL
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Figure I, Site Specific Category I Wetlands, Mississippi Chemical Corporation

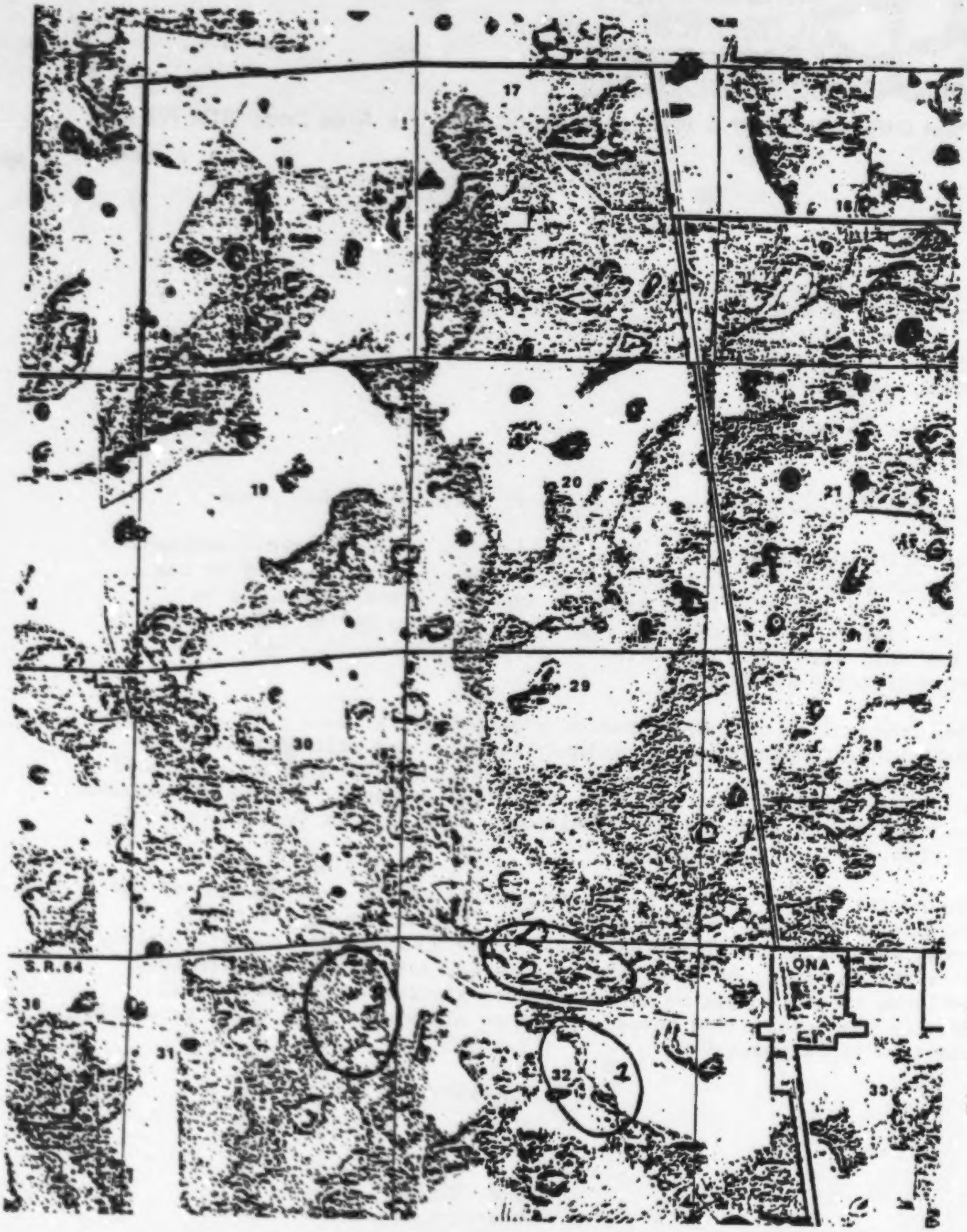
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Figure II.
(Not to scale.)

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A-1

Mississippi Chemical Corporation
We Make Things Grow
Post Office Box 1517 • Wauchula, Florida 33873 • Area Code (813) 773-2279

August 12, 1981

by hand - 17 Aug 81

Mr. John E. Hagan, III, P.E.
Chief - EIS Branch
U. S. EPA, Region IV
345 Courtland Street, NE
Atlanta, Ga. 30305

Dear Mr. Hagan:

RE: MCC Proposal to Create Wetlands in Historically Wet Areas

Mississippi Chemical Corporation is committed to undertake a wetlands creation program in historically wet areas along the channel of Oak Creek. The extent of this wetlands creation project would be at least ninety (90) acres total and would occur in one or all of three areas that have been identified in Sections 31 and 32, T34S, R24E, Hardee County, Florida.

The construction of these wetlands creation areas would make use of all available information about wetlands creation and restoration. This program would be undertaken early in mine life after MCC has completed the pilot wetlands creation experiment that has been previously discussed with you and is shown in the Development Order issued by the State of Florida.

Due to the timing of this pilot experiment and the construction of the beneficiation plant, the construction of the ninety acre wetlands creation program in historically wet areas would coincide approximately with the beginning of mine life. It is our desire to structure this wetlands creation program and associated studies such that it will provide the information needed by EPA to allow mining in areas presently required to be preserved.

Sincerely,

R. A. Risley
General Manager

CS:lw

Appendix B

Prevention of Significant Deterioration
Preliminary Determination

B-3

The State of Florida is presently reviewing the PSD application for the Mississippi Chemical Corporation rock dryer. The preliminary determination for the PSD permit is forthcoming from the Florida Department of Environmental Regulation.

C-1

Appendix C

Hardee County Development Order

C-

STATE OF FLORIDA

LAND AND WATER ADJUDICATORY COMMISSION

IN RE: Application of MISSISSIPPI CHEMICAL CORPORATION for development approval of a phosphate mine development of regional impact in Hardee County.

DOAH CASE NO. 78-739

FINAL ORDER

This case came before the Land and Water Adjudicatory Commission for final determination on March 17, 1981, in Tallahassee, Florida.

Based upon the Joint Stipulation by and agreement among the parties to this action (Bureau of Land and Water Management, Department of Veteran and Community Affairs, Hardee County, Central Florida Regional Planning Council, and Mississippi Chemical Corporation) and the recommendation of the Hearing Officer, it is hereby ORDERED THAT

The Joint Stipulation of the parties and Proposed Amended Development Order, attached hereto and incorporated herein, are adopted as the Development Order, provided that approval of this Development Order shall in no way be construed to preempt the independent analysis of this project by the Governor and Cabinet under Chapter 16C-16, et seq., F.A.C. (Mine Reclamation).

Entered at Tallahassee, Florida, by the Florida Land and Water Adjudicatory Commission through the Secretary to the Commission this 26th day of March, 1981.

John T. Herndon
JOHN T. HERNDON
Secretary to the Land and Water
Adjudicatory Commission

Copies to:

Members of the Commission
Counsel of Record
Board of County Commissioners, Hardee County
Department of Veteran and Community Affairs
  Bureau of Land and Water Management
Central Florida Regional Planning Council

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BEFORE THE FLORIDA DIVISION OF ADMINISTRATIVE HEARINGS

IN RE: Application of MISSISSIPPI CHEMICAL CORPORATION for development approval of a phosphate mine development of regional impact in Hardee County.

CASE NO. 78-739

JOINT STIPULATION

The undersigned parties to this proceeding, pursuant to Section 120.57(3), Florida Statutes and Rule 28-5.603, Florida Administrative Code jointly submit the following and request issuance of a recommended order to the Florida Land and Water Adjudicatory Commission incorporating the findings, proposed development order conditions and conclusions of law as set forth herein.

Background

1. On February 27, 1978, Hardee County approved the application of Mississippi Chemical Corporation (MCC) for development approval of a phosphate mine development of regional impact in Hardee County.

2. On April 17, 1978, the Division of State Planning [the predecessor to the Department of Veteran and Community Affairs (DVCA)] filed its Notice of Appeal and Petition pursuant to Section 380.07, Florida Statutes. The Petition alleges, inter alia, that the Hardee County Development Order did not provide adequate conditions and that the project as approved would have unacceptable adverse regional impacts.

3. The undersigned proceeded to discuss the issues raised by DVCA and negotiated changes to the project plans which resolve these concerns. All parties, representatives of Overlook Groves and the Estate of Louis W. Abrons, and representatives of Florida Audubon Society participated in this process.

4. Changes negotiated by the undersigned have been incorporated in a document entitled "Amended Development Order" which is attached as Exhibit A. These changes are incorporated fully below. Changes to the original Order as issued by the County on February 27, 1978 (the "original order") are indicated by underlining (additions) and striking (deletions). Except for the stipulated facts and changes set forth below, the original order is supported by the record below, is acceptable to the undersigned, and is incorporated herein by reference.

Facts

The undersigned mutually agree and stipulate to the following facts:

5. The project is a phosphate mining operation to be conducted on approximately 14,850 acres of real property owned or controlled by MCC in Hardee County, Florida (the "tract"). The project boundaries and the nature of the proposed operations are described in further detail in the application for development approval (ADA) and other documents submitted by MCC, which are a part of the record below.

6. MCC operations are now expected to begin during the period between 1983 and 1987.

7. On May 4, 1977, the Southwest Florida Water Management District approved MCC's application for a consumptive use permit (number 27703567).

8. On April 15, 1977, the Hardee County Board of County Commissioners (the "Board") approved a request by MCC that the tract be rezoned from A-1 (agricultural) to M-1 (mining and earth moving).

9. On February 18, 1977, MCC submitted its ADA to Hardee County, as required by Section 380.06, Florida Statutes and Chapter 22F-1, Florida Administrative Code (FAC). MCC concurrently submitted its application for

permit for mineral extraction as required by the Hardee County Mining and Earthmoving Ordinance.

10. The MCC ADA was reviewed by Central Florida Regional Planning Council (CFRPC) pursuant to Section 380.06, Florida Statutes. A public hearing on the ADA was conducted on December 7, 1977 at which MCC and members of the public were afforded the opportunity to be heard.

11. The Board received and considered the report and recommendations of CFRPC, as well as comments from other agencies including Southwest Florida Water Management District and the Hardee County Building and Zoning Department.

12. The Board conducted public hearings beginning January 30, 1978 and ending February 27, 1978 after proper notice as prescribed by Section 380.06, Florida Statutes and applicable local law.

13. All interested persons were afforded the opportunity to participate in the public hearings before the Board and were further provided the opportunity to present evidence and argument on all issues, conduct cross-examination and submit rebuttal evidence, file responses, and submit proposed findings of fact. In addition, any member of the general public requesting an opportunity to do so was allowed to present oral or written communications to the Board.

14. The record of the proceedings below was reported by a certified court reporter and has been compiled and indexed. This index is as follows:

(a) Hardee County Zoning Ordinance No. 73-6

(b) Amendment No. 2 to Ordinance No. 73-6 (adopted July 23, 1976)

(c) Amendment No. 1 to Ordinance No. 736 (adopted August 20, 1974)

(d) Master Plan (Application for Permit Approval)

(e) Touche Ross & Co., Report on Examination of Financial Statements and Additional Information, Consolidated Balance Sheet and Officer's Certificate

(f) Petition for Zoning Property to M-1

(g) Appendix to DRI (Volume I)

(h) Appendix to DRI (Volume II)

(i) Executive Summary (of DRI)

(j) DRI Addendum / Figures / Glossary / Maps

(k) DRI Application for Development Approval

(l) Two (2) topographic maps

(m) Letter dated January 26, 1978 from Bromwell, Hendrickson, and Zellars to Hardee County Building and Zoning Department (Certificate re preparation of Master Plan)

(n) Copy of deposit receipt in the amount of $20,233.75 and copies of three checks from MCC to Hardee County in amounts of $7,425.00, $7,425.00 and $5,383.75. [Proof of payment of permit fees]

(o) Supplemental Information Section 38

(p) Supplementary Map No. 1

(q) Certified copy of Affidavit of Publication of notice of meeting of Planning and Zoning Board on April 14, 1977 on rezoning from A-1 to M-1

(r) Certified copy of Minutes of County Planning and Zoning Board meeting on April 14, 1977

(s) Certified copy of Minutes of County Commission meeting on April 15, 1977

(t) Certified copy of Affidavit of Publication of Notice of County Commission Meeting on January 30, 1978 on rezoning from A-1 to M-1

(u) Letter from Caldwell to Building and Zoning Department dated August 18, 1977, with letter dated February 10, 1977 from Alexander to Duane; P. E. LaMoreaux & Associates, Hydrologic Monitoring Program

(v) SWFWMD Order No. 77-9 Granting Permit; Supporting Report for Consumptive Use Permit Application

(w) Water Resources Evaluation Report

(x) Water Resources Evaluation Appendix

(y) An Evaluation of Possible Recharge Alternatives

(z) Excerpt from transcript of CFRPC meeting, numbered pages 37-40

(aa) Second Round Supplemental Responses to CFPRC.

(bb) [Transcript reflects that a document described as a typewritten copy of MCC's proposed permit conditions was marked as Exhibit #27.].

(cc) Copy of hearing transcript.

A complete indexed copy of the record below is attached as Exhibit B and the parties hereto agree that this record below should become a part of the record in this appeal proceeding.

15. Subject to the conditions described below, the development will not have an unfavorable impact on the environment and natural resources of the region.

16. The development will have a favorable impact on the economy of the region.

17. The development will not affect water, sewer, solid waste disposal, or other necessary public facilities.

18. The development will not unduly burden public transportation facilities.

19. The development will not adversely affect the ability of people to find adequate housing reasonably accessible to their places of employment.

20. The parties have considered whether, and the extent to which the proposed development would create an additional demand for or additional use of energy, and have determined that existing sources of energy are sufficient to supply the proposed development and that those existing sources will not be unduly burdened by the development.

21. The development does not unreasonably interfere with the achievement of the objectives of the state land development plan applicable to the area.

22. The proposed development is consistent with all local and state land development laws and regulations.

23. The program for utilization of ground and surface water approved by Southwest Florida Water Management District [SWFWMD] on May 4, 1977, adequately provides for protection of regional water resources and efficient utilization thereof. However, in addition to the terms and conditions of the SWFWMD approval, the parties have agreed

to construction of a well water storage pond in the vicinity of the plant site which may be used as a water management tool. The parties agree that the usage of the water stored in this pond may reduce the need for withdrawals from the aquifer depending upon overall rainfall amount, rainfall pattern on the tract, and general weather conditions. The cost of building and operating this pond is justified by the potential savings of ground water and the possible reduction of discharges during periods of heavy rainfall.

24. The parties have determined that conditional preservation of the hardwood swamp in Section 29 (Township 34 South, Range 24 East) consisting of about 56.7 acres, the 112.5 acre fresh marsh in Sections 32 and 33 (Township 34 South, Range 24 East) and Sections 4 and 5 (Township 35 South, Range 24 East) and the 63.7 acre hardwood swamp in Section 17 (Township 34 South, Range 24 East) is appropriate in light of the water quality, seed source, biological, ecological, and related functions these wetlands serve.

The undersigned parties have further discussed the feasibility of wetlands restoration, and methods for conducting a pilot project to demonstrate the potential success thereof. The details of the project and criteria for determining the success of the project are contained in Paragraph 41 below.

The undersigned parties have determined that preservation of the wetlands outlined above will cause approximately five million tons of phosphate ore to be left in place. Preservation of additional high-ranking wetlands areas requires additional, substantial sacrifices of mineable reserves. The preservation areas outlined above represent a reasonable balance between regional wetlands considerations, the current questions regarding restoration feasibility, and the need for extraction of a valuable mineral resource. In the event restoration is successfully demonstrated, the mining of the preservation areas outlined above will not cause significant adverse regional impact. Furthermore, restoration of extensive mined and disturbed areas as wetlands will mitigate the impacts of the project on regional wetlands. The areas subject to wetlands restoration are shown on the map attached as Exhibit C.

25. The parties have agreed to certain changes to the waste clay disposal and reclamation plan which are intended to minimize above-grade storage of clays. These plans reflect application of state-of-the art technology, applied on a site specific basis, to achieve the minimum amount and effect of above-grade storage of waste clays. The plans are as follows:

(a) Settling area MC-8 will be eliminated from the DRI/ADA plans by (a) back-filling "lake areas" as initially proposed; (b) reducing the size of the plant clear water pond and relocating it on an unmined area, leaving the previously designated location (a mined area) for below-grade clay storage; (c) reducing the depth of the Brushy Creek Reservoir during the last part of mine life by back-filling with waste clay. This represents a reduction of above-grade storage by 1063 acres from the original plan.

(b) Waste clays assigned to settling areas MC-2 and MC-4 will be rehandled late in mine life and after completion of mining activities. The rehandled clays will be used to fill in the voids left by the final stages of mining. This procedure will allow both settling areas to be reduced to approximate original topography, eliminating approximately 871 acres of above-grade clay storage.

(c) MCC will utilize sand/clay mix material for capping above-grade storage areas. This "blanket" approach provides the best alternative for consolidation of clays. By using the sand/clay cap and modifying the configuration of above-grade settling areas, the final reclaimed topography will be around 40 to 45 feet for settling areas east of the Fort Green-Ona Road and the existing railroad, 25 feet in the central part of the tract, and about 10 feet in the western part of the tract. After elimination of acres MC-2 and M-4, total above-grade storage will be about 2200 acres east of the railroad with an additional 1447 acres west of the railroad.

(d) MCC will adopt advances in waste clay disposal technology which are feasible on a plant scale and which would result in reduction of above-grade clay storage requirements.

The undersigned parties agree that these changes represent the best possible waste disposal and reclamation plan for the MCC project, considering state-of-the art technology, environmental factors, and the objectives of Chapter 380, Florida Statutes.

26. The undersigned have considered waste disposal and reclamation plans and technologies proposed by other mining operations, including chemical and mechanical processes, which may result in substantially less above-grade storage of clay. The parties have determined that differences in results are caused by site specific characteristics and that these other methods and technologies are not appropriate to the MCC project. On the basis of state-of-the art technology, MCC can commit to no less than 3,700 acres of above-grade storage at this time. However, MCC has further committed to investigate and implement feasible advances in technology which could reduce the volume of above-grade storage required for this project.

27. The undersigned agree that the waste disposal and reclamation plan currently proposed by MCC is acceptable and will not create significant adverse regional impacts. The implementation of any advances in technology which reduce the volume of above-grade storage will further reduce potential regional impacts.

28. The changes set forth in Paragraph 25 will require the back-filling of mined areas previously designated for "lakes". The elimination of these lakes is not consistent with the original desires of Hardee County, but is acceptable to the County and to the other parties to this Stipulation in light of the need for reducing above-grade clay storage.

29. The changes set forth in Paragraph 25 further require reduction of the depth of the Brushy Creek Reservoir, which is designed to store surface water for use in the MCC mining and beneficiation process. Back-filling of the reservoir will reduce its storage volume but at that stage in the life of the mine, additional volume will be available elsewhere in the mine.

30. The changes set forth in Paragraph 25 require the rehandling of clays late in mine life or after completion of mining activities. This rehandling process is necessary in order to reduce above-grade settling, and offsets the cost and operational difficulties caused thereby. Furthermore, the use of energy for relocating waste clays has been considered and found to be a reasonable use of energy resources.

31. MCC will utilize a sand/clay mix material for capping above-grade storage areas. This will allow maximum benefit from the limited amount of sand available for mixing with clay. This benefit is derived from concentrating the weight of the available sand at the top of the column of clay, thus exerting the maximum influence for consolidation.

32. The undersigned parties have discussed the appropriate configuration for lakes which will remain on site. If the depth of these lakes is limited to 25 feet at the deepest point, with an average depth of greater than 15 feet, and if the lakes have extensive littoral zones placed irregularly around the shore with side slopes of 4:1 or less, water quality and fish and wildlife values will be

enhanced. Restoration of Oak Creek, Brushy Creek and Hickory Creek to a meandering configuration with adjacent floodplains, will further enhance the water quality and fish and wildlife values of the reclaimed land.

33. The undersigned parties agree that MCC requires the capability of drying up to 3 million tons per year of rock, in order to supply its existing chemical fertilizer facilities, which cannot accept wet rock, and to be in a reasonably competitive position to market the balance of its production. However, some reduction in rock drying may be possible by sales of surplus to wet rock customers. MCC is willing to actively seek wet rock customers and thereby mitigate the effects of rock drying. Under these circumstances, together with the application of Best Available Control Technology for air emissions, potential impacts on regional air quality have been mitigated to the extent possible and should be acceptable.

General Conditions

34. The final order to be adopted by the Florida Land and Water Adjudicatory Commission should constitute final approval of the ADA and application for permit for mineral extraction as modified, which were submitted by MCC to Hardee County as described above.

35. Definitions contained in Chapter 380, Florida Statutes should control the construction of terms appearing in the final order.

36. The final order should not encompass any proposed developments which are not commenced until after the expiration of the period of effectiveness of the final order, or which constitute a substantial deviation from the terms of the ADA, the application for permit for mineral extraction, or the associated and supporting documents. As used in the final order, substantial deviation should mean any change to the development of regional impact as approved

herein which creates a reasonable likelihood of additional adverse regional impact or any other regional impact created by the change not previously reviewed by the Central Florida Regional Planning Council. Provided, however, that in determining whether such a substantial deviation has occurred, the Board may require a review as changes in the design or operation occur, by such authorities as the Board may designate. Changes in the design or operation of the mine or beneficiation plant which are made as a result of a permit requirement or condition imposed by the Department of Natural Resources, the Department of Environmental Regulation, or any water management district created by Section 373.069, Florida Statutes, or their successor agencies, or any appropriate federal regulatory agency, shall not be deemed a substantial deviation which requires further review and approval according to the provisions of Section 380.06, Florida Statutes.

37. The scope of operations to be permitted pursuant to the final order are those specified in the ADA, the application for permit for mineral extraction, and all documents submitted in support of these applications, all of which are hereby incorporated by reference, as modified by the conditions set forth below.

38. Further review of requests for local development permits submitted by MCC shall not be required, except that:

(a) Further review pursuant to Chapter 380, Florida Statutes will be necessary:

(1) Should the development not be capable of at least 50% production by June 30, 1988;

(2) Should a substantial deviation from the terms of this development order occur.

(b) Further approval by local government may be necessary if any deviation from requirements of the Hardee County Mining Ordinance occur.

Specific Development Conditions

The approval of a final order shall further be conditioned upon MCC complying with the following conditions:

39. Water: MCC shall adhere strictly to the provisions of the (SWFWMD) Southwest Florida Water Management District Consumptive Use Permit granted on May 4, 1977. Additionally, a water storage pond shall be constructed and used to reduce the need for "make up" water. Notice of any requests for modification to the original SWFWMD permit must be provided to the Hardee County Board of County Commissioners, the Regional Planning Council, and the DVCA. MCC shall also comply with Section 8.B and 8.D of Amendment No. 1 of the Hardee County Mining and Earthmoving Ordinance.

If other water consuming activities are undertaken on this land, said total amount of water now permitted shall not be exceeded.

Stream flows and drainage areas shall be restored to their pre-mining quantity and quality upon the completion of reclamation.

40. Wells: Within seven months from the date the appeal by the DVCA is resolved, MCC shall place and have operational two lower Floridan observation wells as designated in Exhibit D in Section 14, T34S, R24E and in Section 28, T34S, R23E for the purpose of monitoring the ground water potentiometric surface and water quality.

The Board may require additional observation wells, if it is deemed necessary to obtain further information, at sites to be designated by the County and set forth on Exhibit D, within 30 days after the approval of the Development Order. If additional wells are required, said wells shall be constructed and be operational within seven months from the date the DVCA appeal is resolved. These wells, designated on Exhibit D, shall be monitored on a continuous basis and shall be maintained for the purpose of monitoring the water levels from the shallow water table aquifer, potentiometric surface of the upper unit of the Floridan Aquifer and the lower unit of the Floridan Aquifer. At the time of the annual review, a report will be made on the continuing study of the feasibility of the use of recharge wells on the MCC property.

The Board shall establish minimum water levels for the shallow water table aquifer, the upper unit of the Floridan Aquifer, and the lower unit of the Floridan Aquifer at a future date after 24 months of data gathering, but before actual mining. Maintenance of these levels shall require that MCC reduce withdrawal from ground water sources at times when water levels fall below the minimum.

MCC shall take corrective measures and place in an operable condition any well that is in existence on the date of initiation of consumptive water use (#77-9) that may be damaged due to the lowering of the water level during the first 4 years of MCC mining operation within a radius of three (3) miles from the designated production wells as approved by SWFWMD order #77-9, excluding mechanical failure and faulty equipment in the above mentioned well.

After the expiration of the aforesaid four (4) years, MCC shall remain responsible for all such wells that are damaged by MCC.

MCC shall also assume the responsibility and the corrective measures to put in an operable condition any shallow well, down to 300 feet in depth, in existence on the date of initiation of consumptive water use (#77-9) within 1/4 mile (1320 feet) of their property perimeter where actual excavation of phosphate matrix is being conducted.

In the event any well as described in the preceding paragraphs be located within the prescribed protected distance and such distances affect two or more phosphate and/or chemical companies, then in that event the responsibility and corrective measures required above shall be borne equitably by said phosphate and/or chemical companies.

41. Wetlands Restoration Pilot Project: MCC shall conduct an experimental wetlands restoration pilot project early in mine life, as described below:

(a) Prior to the initiation of MCC's experimental wetlands project, the state-of-the-art in freshwater wetlands creation will be assessed by reviewing pertinent literature and by contacting agencies and individuals actively involved in wetlands creation projects.

(b) The following experimental project will be undertaken early in mine life.

1. Experimental Plot Selection

Six individual experimental wetlands will be constructed on the MCC property, each being approximately one acre in size. Three of these will be designed to become hardwood swamps, and three will be designed to become freshwater marsh.

The experimental wetlands will be located on unmineable land in the vicinity of the common section corner of Sections 29, 30, 31, 32 (T34S, R24E). This area was chosen because:

1) a natural water source is present,
2) natural swamps and marshes are relatively close,
3) the site is already clear of timber, and
4) vehicular access is relatively easy.

2. Preparation of Experimental Plots

Each experimental wetlands site will be completely cleared of vegetation and excavated. Mineral soil (i.e., not topsoil) will then be used to shape the topography so

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that suitable size, depth, contour and hydroperiod are established. This mineral soil will replicate potential subsurface regimes likely to be encountered in actual mining and reclamation.

Current research indicates that mulching is one of the better ways now known to establish wetlands vegetation, so this technique will be used on at least one of the marsh and one of the swamp sites unless future research shows other techniques to be more effective. The process of mulching involves the removal of the topsoil and accompanying vegetative material from an existing wetland and its subsequent deposition on the experimental site. Mulch will be obtained from lands approved for either major disturbance or mining.

The remaining four sites will be constructed using various modes of wetlands creation selected from alternatives such as natural re-establishment, seeding, planting, variations of the mulch techniques (amount applied, strip-mulching, etc.), or variations in physical-chemical components (fertilization, different hydroperiods, etc.). The approach actually used will be determined based upon the best information available at the time.

It is expected that planting of tree seedlings or saplings will be required on the experimental swamp sites. These may be obtained either from adjacent onsite areas, the Division of Forestry or commercial sources.

3. Protection of Experimental Plots

All experimental wetlands will be protected from cattle grazing and other agricultural operations.

4. Model Areas

The adequacy of any wetlands creation experiments shall be based on progression of the experimental areas toward functional equivalency as compared to model areas. The following areas, as shown on the attached map (Exhibit

E); will be used as model areas. All model areas will be verified as being typical for that wetland type on the property.

Marshes - A - Large marsh in Sec. 28, T34S, R23E

B - Marsh at corner of Secs. 28, 29, 32, 33, T34S, R24E

C - A small marsh just south of SR 64 in Sec. 31, T34S, R24E

Swamps - D - Large swamp in Section 17, T34S, R24E

E - Swamp in Section 28, T34S, R23E

F - A small swamp in Secs. 32 and 33, T34S, R23E on Post Plant Road.

(c) The following factors shall be considered in determining the functional equivalency of experimental and model wetlands: fauna and flora present, diversity and density of each, hydroperiod and water storage per acre, and water quality enhancement. Consequently, the monitoring program during the experimental wetlands project will entail a number of specific field parameters relating to the vegetation, soils, wildlife, water quality and hydrology of the wetlands.

1. The various parameters used to evaluate wetlands reclamation are:

vegetation composition
vegetation structural complexity
vegetation productivity
soil organic matter
litter weight
litter depth
bird density and diversity
mammal density and diversity
water quality parameters
hydrologic character

The above parameters for the experimental wetlands are not expected to be initially comparable to the same measurements taken from the appropriate model wetlands. However, with time, most of these parameters are expected to change until they are close to "natural" values. The consistent progression of these parameters towards values found in model systems, rather than actual equivalency, will be the criterion for evaluating whether functional equivalency is obtained.

(i) Vegetation

Vegetation studies will compare the composition, structural complexity, and productivity of the floral components of the model wetlands and the created wetlands.

(A) Composition. Species composition of overstory, understory, and groundcover strate will be determined by a variety of techniques, Overstory vegetation will be sampled by the point quarter technique, yielding data on species density, frequency, and basal area. Understory vegetation will be sampled by a modified point quarter technique giving species density and frequency. Groundcover vegetation will be sampled by either a point-intercept method or a quadrat method, depending on field conditions, providing percent cover by species and frequency of occurrence. For the model wetlands, overstory and understory strata will be sampled once and groundcover vegetation will be sampled seasonally (quarterly) for at least one (1) year. For the experimental wetlands, groundcover vegetation will be sampled quarterly for the duration of the experimental wetlands project. Understory and overstory will be sampled in experimental wetlands often enough to reflect major changes in species density or composition. Special attention will be given to describing overstory reproduction (seedlings) for both model and experimental wetlands.

(B) Structural Complexity. The vertical and horizontal structural complexity of vegetation greatly affects wildlife utilization and is an important indicator of a system's ecologic maturity. The measurement of structural complexity will be accomplished by optical devices such as solar radiometers or gamma reflectors. One year of seasonal readings will be taken for model wetlands, whereas, experimental wetlands will be monitored on a continuing basis.

(C) Productivity. The net primary productivity of wetlands ground cover vegetation will be derived from clip plots of standing crops. Tree cores will be taken in model wetlands to determine the age of existing timber and to establish the relationship between trunk diameter and age. Cores will be taken in experimental wetlands as trees of unknown age (i.e. nonplanted) reach a significant size. It should also be recognized that basal area and optical density data have a bearing on biomass and consequently may serve as partial indicators of net production.

(ii) Soils

Soil sampling of model and experimental wetlands will include soil organic matter (top 10 cm), litter weight, litter depth, and qualitative examination of soil profile to one meter depth. Litter weight and depth will be sampled quarterly, with model wetlands being sampled for one (1) year and experimental wetlands for the duration of the experimental wetlands project.

(iii) Wildlife

Aside from general qualitative wildlife observations, time-area counts (for birds) and small mammal trapping will be conducted seasonally for one (1) year minimum in model wetlands. These techniques will be duplicated for experimental wetlands once vegetative cover has been established.

(iv) Water Quality

Total Suspended Solids, phosphorus, pH, dissolved oxygen, and biochemical oxygen demand will be sampled in both model and experimental wetlands. Model wetlands will be sampled monthly when flow-through is occurring, with a sampling following the first storm event after no flow. Samples will be taken quarterly during periods of no flow.

(v) Hydrology

The hydrologic character of both model and experimental wetlands will be determined via quarterly monitoring. Water level recorders, ground contour systems, rain gauges, pan evaporators, and peizometer wells will be used as necessary to obtain data.

42. Wetlands Preservation and Restoration: The hardwood swamp in Section 29, (T34S, R24E) consisting of about 56.7 acres, shall be preserved. However, when and if MCC can demonstrate to the satisfaction of the DVCA and Hardee County that hardwood swamp restoration can be successfully accomplished, and the concurrence of DVCA and the county is confirmed in writing, the 56.7 acre hardwood swamp in Section 29 may be mined without further DRI review. The 112.5 acre fresh marsh in Sections 32 and 33 (T34S, R24E) and in Sections 4 and 5 (T35S, R24E) and the 63.7 acre hardwood swamp in Section 17 (T34S, R24E) shall be left unmined until MCC demonstrates to the satisfaction of DVCA and the county that the pilot project is successful.

Furthermore, using information gained from the wetlands restoration pilot project, MCC will create hardwood swamps and fresh marsh on suitable land, as shown on Exhibit C, with approximately 475 acres of hardwoods and 1975 acres of marsh restored. After completion of this program, acreage equal to about 85% of the original wetlands acreage will exist. If some higher percentage of restoration is required by rules of the Department of Natural Resources applicable at the time of DNR permit review, MCC shall comply. Requests for variances to mine in the remaining floodplains shall be made on an annual basis at the time of mining plan review for the next year.

43. Reclamation: Vegetation to be used in reclamation will be with native species only except where appropriate for agricultural use and such selection shall be made in consultation with the County Agent. MCC will maintain vegetation on preservation areas and on reclaimed land. MCC will adhere to the waste disposal and reclamation provisions presented in the DRI-ADA, as further described below and on Exhibit F. MCC shall submit, at least 6 months prior to the use of the initial settling area, the method of clay disposal to be used in that area. Each year thereafter, this subject shall be addressed at the time of Annual Review. MCC will utilize a sand/clay mix technique for capping above-grade storage areas and will adopt advances in technology which are feasible on a plant scale and which would result in reduction of above-grade storage of clay. Above-grade disposal areas shall not exceed an average of 60 feet in height above the natural grade during active life of any settling area. At no point shall actual dam height exceed 65 feet above natural grade. Portions of the dam approaching 65 feet shall not extend laterally more than 100 yards at any one place. Clay storage areas shall not occupy more than 3,700 acres after reclamation. The depth of all lakes

on the property will be limited to 25 feet at the deepest point and shall have an average depth no greater than 15 feet with extensive littoral zones placed irregularly through the lake and side slopes of 4:1 or less, unless research accepted by the Board, the Central Florida Regional Planning Council, MCC, and the DVCA shows that design modifications would be beneficial to the maintenance of water quality and fish and wildlife values. Oak Creek, Brushy Creek and Hickory Creek shall be restored to a meandering stream configuration with adjacent floodplains similar in acreage to those that existed prior to mining. Restoration of streams and wetlands, shall be as shown generally on Exhibit C. Subsequent to reclamation, connection to the natural system, and acceptance by Hardee County, MCC shall not degrade water quality below state water quality standards.

44. Roads: MCC is to coordinate with Hardee County and the Florida Phosphate Council and other phosphate companies planning to mine in the area for the upgrading of the Fort Green-Ona Road and the Vandolah Road to an all-weather, hard-surfaced road capable of supporting state maximum load and size trucks. In the event that the Fort Green-Ona Road is not improved prior to commencement of construction, a plant road must be built to a hard-surfaced arterial road capable of supporting maximum capacity trucks. An alternative to either of the above proposals is to construct a road from State Road 62 to State Road 64 which will meet state load and size standards and then dedicate the road to the County. Where possible, mining may be conducted under contiguous transportation rights of way and under man-made structures with MCC to provide relocation of displaced activity to similar land form.

MCC will deed to Hardee County additional right-of-way up to 50 feet from current right-of-way for public roads where MCC owns the land along the road. Right-of-way along existing roads on the date of this order shall control the setback as set forth in Item 8-1-b of the Hardee County Mining and Earthmoving Ordinance. It is further agreed that when the setback is reduced due to deeding additional right-of-way along that area outside the original setback, the area will be reclaimed within 30 (thirty) days after the area is mined. MCC shall notify the County Engineer whenever vehicles having a GVW greater than 40,000 pounds and creating more than four trips per day will be using County roads. MCC shall also get a special permit from the County Engineer or conform to any future Hardee County operating policy regarding vehicle permits, whenever the vehicle load, width and/or length requires a state permit.

45. Land & Lakes Reclamation Area: MCC shall, if it acquires the surface rights for the tract, convey by Warranty Deed a minimum of 640 acres to the County of Hardee in the land and lake reclamation area for the purpose of a public recreation park.

46. Rock Dryer: MCC requires three million tons per year drying capacity, but will reduce the actual amount of rock dried by the amount of surplus sold to wet rock customers. Furthermore, the company will actively seek wet rock customers.

Conclusions of Law

47. On the basis of the foregoing, the undersigned parties agree that the proposed development is consistent with the objectives and requirements of Chapter 380, Florida Statutes, and should be approved.

C. Laurence Keesey

C. Laurence Keesey
Attorney for Bureau of
Land & Water Management,
Division of Local Resource
Management, Department of Veteran
and Community Affairs

Judith S. Kavanaugh
Environmental Counsel for
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Jeff J. McKibben
Attorney for Central Florida
Regional Planning Council

Roger W. Sims
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Attorneys for Mississippi
Chemical Corporation

COUNTY OF HARDEE, STATE OF FLORIDA

IN RE: The application for development approval of a development of regional impact and the application for a permit for mineral extraction and other authorizations required by amendment No. 1 to Hardee County Ordinance No. 73-6 by Mississippi Chemical Corporation

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AMENDED DEVELOPMENT ORDER

WHEREAS, Mississippi Chemical Corporation (hereinafter referred to as "MCC"), filed on February 18, 1977, with the Board of County Commissioners of Hardee County, Florida (hereinafter referred to as "the Board"), a political subdivision of the State of Florida, an Application for Development Approval of a Development of Regional Impact (hereinafter referred to as "ADA"), pursuant to Section 380.06, Florida Statutes, an application for a Permit for Mineral Extraction and other authorizations as required by the Mining and Reclamation Master Plan as provided in that ordinance, copies of all applications filed with, and approvals received from all applicable federal, state and local agencies, evidence of financial responsibility, and an application fee; and

WHEREAS, these proceedings relate to a proposed phosphate mining operation to be conducted upon approximately 14,850 acres of real property (hereinafter referred to as "the tract"), owned or controlled by MCC in Hardee County, Florida in accordance with the aforesaid documents; and

WHEREAS, MCC has previously applied for, and was granted a zoning variance by the Board on April 15, 1977, changing the zoning classification of the land from A-1 (Agricultural) to M-1 (Mining and Earth Moving District); and

WHEREAS, MCC has previously applied for, and was granted, Consumptive Use Permit Number 27703567 on May 4, 1977 by the Southwest Florida Water Management District for proposed phosphate mining and processing operations on the tract; and

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Exhibit A

CA-1

WHEREAS, The Board has received and considered the report and recommendations of the Central Florida Regional Planning Council, and has received comments from other agencies, including the Southwest Florida Water Management District and the Hardee County Building and Zoning Department; and

WHEREAS, the Central Florida Regional Planning Council in its report to the Board fully performed the duties required of it pursuant to Section 380.06(8), Florida Statutes; and

WHEREAS, the Board conducted public hearings beginning January 30, 1978 and ending February 27, 1978, after notification, publication and posting in the manner prescribed by Section 380.06, Florida Statutes, and Hardee County Ordinance No. 73-6, as amended; and

WHEREAS, all those identified as parties to these proceedings at the public hearing were afforded the opportunity to file responses, to present evidence and argument on all issues, to conduct cross-examination and submit rebuttal evidence, and to submit proposed findings of fact to the Board. In addition, any member of the general public requesting to do so was given an opportunity to present oral or written communications to the Board, and all parties were afforded an opportunity to cross-examine any member of the general public so appearing.

WHEREAS, the Board has considered the above-described testimony and evidence, and has reviewed all documents submitted by each party and members of the general public, and the Board being otherwise fully advised in the premises,

NOW, THEREFORE, BE IT RESOLVED, by the Board of County Commissioners of Hardee County, Florida:

1. This Resolution shall constitute the Development Order of the Board issued in response to the ADA and Application for Permit for Mineral Extraction, together with all supporting documents, submitted herein by MCC.

2. That the definitions contained in Section 380, Florida Statutes, shall control the construction of any defined terms appearing in this Development Order.

3. This Development Order shall be deemed rendered as of the date of this Resolution for purposes of computing the 45-day appeal period provided in Section 380.07(2), Florida Statutes.

4. This Development Order shall remain in effect for a period of 48 years from the date of final resolution of the appeal by the Department of Veteran and Community Affairs, provided that the effective period of this Order may be extended by the Board upon a finding of excusable delay in any proposed development activity.

5. This Development Order shall not encompass any proposed developments which constitute a substantial deviation from the terms of the ADA, the Application for Permit for Mineral Extraction, together with all associated and supporting documents, or which are not commenced until after the expiration of the period of effectiveness of this Order. As used in this Order, substantial deviation shall mean any change to the Development of Regional Impact as approved herein which creates a reasonable likelihood of additional adverse regional impact, or any other regional impact created by the change not previously reviewed by the Central Florida Regional Planning Council. Provided, however, that in determining whether such a substantial deviation has occurred, the Board may require a review as changes in the design or operation deviation have occurred, by such authorities as the Board may designate. Changes in the design or operation of the mine, or beneficiation plant which are made as a result of a permit requirement, or condition imposed by the Department of Natural Resources, the Department of Environmental Regulation, or any water management district created by Section 373.069, Florida

Statutes, or their successor agencies, or any appropriate federal regulatory agency, shall not be deemed a substantial deviation which requires further review and approval according to the provisions of Section 380.06, Florida Statutes.

6. The scope of operations to be permitted pursuant to this Order are those specified in the ADA, the Application for Permit for Mineral Extraction, together with all documents submitted in support of those applications, all of which are hereby incorporated by reference in this Order, as modified by the conditions hereinafter set forth.

NOW THEREFORE, BE IT FURTHER RESOLVED, by the Board, as findings of fact:

1. MCC owns or controls approximately 14,850 acres of land in Hardee County, Florida, upon which it proposes to conduct phosphate rock mining and beneficiation operations. Operations are expected to begin during the period between 1983 and 1987.

2. The proposed mining development is not located in an area of critical state concern.

3. The State of Florida has not adopted a land development plan applicable to the area in which the proposed development is to be located.

4. The Board has considered whether, and the extent to which the proposed developments would create an additional demand for, or additional use of energy, and has determined from the record herein that existing sources of energy are sufficient to supply the energy required by these developments, and that those existing sources will not be unduly burdened by the proposed developments.

5. The proposed developments are consistent with all local and state land development laws and regulations.

6. The Central Florida Regional Planning Council, pursuant to its duties set forth in Section 380.06, Florida Statutes, has conducted a complete review for the ADA to

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determine whether, and the extent to which this development will have favorable or unfavorable impacts upon the environment, natural resources and economy of the region, as well as the other criteria set forth in Section 380.06(6), Florida Statutes. The report of the Central Florida Regional Planning Council was filed with the Board on January 6, 1978, and has been thoroughly reviewed by the Board's staff. This report recommended approval with conditions for the mining operation. The report of Central Florida Regional Planning Council and the conditions contained therein were individually and collectively considered by the Board at the various public hearings and workshops which were conducted in this matter.

BE IT FURTHER RESOLVED, by the Board, that the Application for Development Approval of a Development of Regional Impact and the Application for Permit for Mineral Extraction be, and the same are hereby approved, subject to the following conditions, restrictions and limitations:

1. Further review of requests for local development permits submitted by MCC shall not be required, except that:

(a) Further review pursuant to Section 380, Florida Statutes, will be necessary:

(1) Should the development not be capable of at least 50% production by June 30, 1988;

(2) Should a substantial deviation from the terms of this Development Order occur.

(b) Further approval by local government may be necessary if any deviation from requirements of the Hardee County Mining Ordinance No. 73-6, Amendment No. 1 occur.

2. The approval of this Development Order shall further be conditioned upon MCC complying with the following conditions taken from and which are consistent with the

report of the Central Florida Regional Planning Council dated January 6, 1978, and rewritten by the Board to clarify the intent thereof:

CONDITION A. WATER

MCC shall adhere strictly to the provisions of the (SWFWMD) Southwest Florida Water Management District Consumptive Use Permit granted on May 4, 1977. Additionally, a water storage pond shall be constructed and used to reduce the need for "make up" water. Notice of any requests for modification to the original SWFWMD permit must be provided to the Hardee County Board of County Commissioners, the Regional Planning Council, and the Department of Veteran and Community Affairs. MCC shall also comply with Section 8.B and 8.D of Amendment No. 1 of the Hardee County Mining and Earth Moving Ordinance.

If other water consuming activities are undertaken on this land, said total amount of water now permitted shall not be exceeded.

Stream flows and drainage areas shall be restored to their premining quantity and quality upon the completion of reclamation.

CONDITION B. WELLS

Within seven months from the date the appeal by the Department of Veteran and Community Affairs (DVCA) is resolved, MCC shall place and have operational two lower Floridan observation wells as designated in Exhibit A in Section 14, T34S, R24E and in Section 28, T34S, R23E for the purpose of monitoring the ground water potentiometric surface and water quality.

The Board may require additional observation wells, if it is deemed necessary to obtain further information, at sites to be designated by the County and set forth on Exhibit A, within 30 days after the approval of the

Development Order. If additional wells are required, said wells shall be constructed and be operational within seven months from the date the DVCA appeal is resolved. These wells, designated on Exhibit A, shall be monitored on a continuous basis and shall be maintained for the purpose of monitoring the water levels from the shallow water table aquifer, potentiometric surface of the upper unit of the Floridan Aquifer and the lower unit of the Floridan Aquifer. At the time of the annual review, a report will be made on the continuing study of the feasibility of the use of recharge wells on the MCC property.

The Board shall establish minimum water levels for the shallow water table aquifer, the upper unit of the Floridan Aquifer, and the lower unit of the Floridan Aquifer at a future date after 24 months of data gathering, but before actual mining. Maintenance of these levels shall require that MCC reduce withdrawal from ground water sources at times when water levels fall below the minimum.

MCC shall take corrective measures and place in an operable condition any well that is in existence on the date of initiation of consumptive water use (#77-9) that may be damaged due to the lowering of the water level during the first 4 years of MCC mining operation within a radius of three (3) miles from the designated production wells as approved by SWFWMD order #77-9, excluding mechanical failure and faulty equipment in the above mentioned well.

After the expiration of the aforesaid four (4) years, MCC shall remain responsible for all such wells that are damaged by MCC.

MCC shall also assume the responsibility and the corrective measures to put in an operable condition any shallow well, down to 300 feet in depth, in existence on the date of initiation of consumptive water use (#77-9) with 1/4 mile (1320 feet) of their property perimeter where actual excavation of phosphate matrix is being conducted.

In the event any well as described in the preceding paragraphs be located within the prescribed protected distance and such distances affect two or more phosphate and/or chemical companies, then in that event the responsibility and corrective measures required above shall be borne equitably by said phosphate and/or chemical companies.

CONDITION C. WETLANDS PRESERVATION AND RESTORATION

MCC shall conduct an experimental wetlands restoration pilot project early in mine life, as described in appendices "C-2" and "C-3".

The hardwood swamp in Section 29, (T34S, R24E) consisting of about 56.7 acres, shall be preserved. However, when and if MCC can demonstrate to the satisfaction of the DVCA and Hardee County that hardwood swamp restoration can be successfully accomplished, and the concurrence of DVCA and the county is confirmed in writing, the 56.7 acre hardwood swamp in Section 29 may be mined without further DRI review. The 112.5 acre fresh marsh in Sections 32 and 33 (T34S, R24E) and in Sections 4 and 5 (T35S, R24E) and the 63.7 acre hardwood swamp in Section 17 (T34S, R24E) shall be left unmined until MCC demonstrates to the satisfaction of DVCA and the county that the pilot project is successful. Furthermore, using information gained from the wetlands restoration pilot project, MCC will create hardwood swamps and fresh marsh on suitable land, as shown on Exhibit C, with approximately 475 acres of hardwoods and 1975 acres of marsh restored. After completion of this program, acreage will exist equal to the greater of either (a) approximately 85% of the original wetland acreage, or (b) the percentage of wetlands required to be restored under the provisions of Section 16C-16.051(4), Florida Administrative Code, which is applicable at the time MCC reclamation is approved by DNR. (It is understood for informational purposes that at the time of the effective date of this Development Order, Section 16C-16.051(4), Florida Administrative Code, requires that 100% of the acreage of wetlands on all tracts subject to the jurisdiction of the Department of Natural Resources under Chapter 16C-16, Florida Administrative Code must be restored.) Requests for variances to mine in the remaining floodplains shall be made on an annual basis at the time of mining plan review for the next year.

CONDITION D. RECLAMATION

Vegetation to be used in reclamation will be with native species only except where appropriate for agricultural use and such selection shall be made in consultation with the County Agent. MCC will maintain vegetation on preservation areas and on reclaimed land. MCC will adhere to the waste disposal and reclamation provisions presented in the DRI-ADA, as further described in Exhibit F. MCC shall submit, at least 6 months prior to the use of the initial settling area, the method of clay disposal to be used in that area. Each year thereafter, this subject shall be addressed at the time of Annual Review. MCC will utilize a sand/clay mix technique for capping above-grade storage areas and will adopt advances in technology which are feasible on a plant scale and which would result in reduction of above-grade storage of clay. MCC shall undertake demonstration or pilot projects of technologies which have been developed to the point that such demonstration or pilot projects are feasible and would be of benefit. Initially, MCC shall within three years after the commencement of mining pursuant to this Development Order, undertake a pilot project to

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investigate the value and performance of a clarifier/thickener process using chemical flocculants in reducing the volume of waste clays. Subsequent to the implementation of this initial pilot project, MCC shall in conjunction with each annual review present a report concerning technological advancements which have taken place during the preceeding year, including a statement of the views of MCC on whether or not any such technological advancement(s) have reached a state where a pilot or demonstration project in conjunction with the MCC mine governed by this Development Order would be possible. Initiation of such pilot projects may be required of MCC by modification of the Development Order at the time of annual review. Above grade disposal areas shall not exceed an average of 60 feet in height above the natural grade during active life of any settling area. At no point shall actual dam height exceed 65 feet above natural grade. Portions of the dam approaching 65 feet shall not extend laterally more than 100 yards at any one place. Clay storage areas shall not occupy more than 3,700 acres after reclamation. The 3700 acre size limitation is an absolute maximum allowable, considering technology available as of the effective date of this Development Order, and shall be reduced if upon annual review it is determined that advances in technology which are feasible on a plant scale would result in reduction of above-grade storage of clay. The reduction in the maximum allowable size of the above-grade storage area order at the time of any annual review shall be commensurate with the capabilities of the technological advances determined feasible at that time. It is the express intent of this Development Order that "To the greatest extent practical, all waste clays shall be disposed of below grade, in a manner that avoids the long term existence of elevated clay disposal areas." as requried by Section 16C-16.051(9)(a)2, Florida Administrative Code, and that assurance that this requirement is met be facilitated through the annual review process. The depth of all lakes on the property will be limited to 25 feet at the deepest point and shall have an average depth no greater than 15 feet with extensive littoral zones placed irregularly through the lake and side slopes of 4:1 or less, unless research accepted by the Board, the Regional Planning Council, CFRPC, MCC, and the DVCA shows that design modifications would be beneficial to the maintenance of water quality and fish and wildlife values. Oak Creek, Brushy Creek and Hickory Creek shall be restored to a meandering stream configuration with adjacent floodplains similar in acreage to those that existed prior to mining. Restoration of streams and wetlands, shall be as shown generally on Exhibit C. Subsequent to reclamation, connection to the natural system, and acceptance by Hardee County, MCC shall not degrade water quality below state water quality standards.

CONDITION E. ROADS

MCC is to coordinate with Hardee County and the Florida Phosphate Council and other phosphate companies planning to mine in the area for the upgrading of the Fort Green-Ona Road and the Vandolah Road to an all-weather, hard-surfaced road capable of supporting state maximum load and size trucks. In the event that the Fort Green-Ona Road is not improved prior to commencement of construction, a plant road must be built to a hard-surfaced arterial road capable of supporting maximum capacity trucks. An alternative to either of the above proposals is to construct a road from State Road 62 to State Road 64 which will meet state load and size standards and then dedicate the road to the County. Where possible, mining may be conducted under contiguous transportation rights of way and under man-made structures with MCC to provide relocation of displaced activity to similar land form.

MCC will deed to Hardee County additional right-of-way up to 50 feet from current right-of-way for public roads where MCC owns the land along the road. Right-of-way along existing roads on the date of this order shall control the setback as set forth in Item 8-1-b of the Hardee County Mining and Earth Moving Ordinance. It is further agreed that when the setback is reduced due to deeding additional right-of-way along that area outside the original setback, the area will be reclaimed within 30 (thirty) days after the area is mined. MCC shall notify the County Engineer whenever vehicles having a GVW greater than 40,000 pounds and creating more than four trips per day will be using County roads. MCC shall also get a special permit from the County Engineer or conform to any future Hardee County operating policy regarding vehicle permits, whenever the vehicle load, width and/or length requires a state permit.

CONDITION F. LAND & LAKES RECLAMATION AREA

MCC shall, if it acquires the surface rights for the tract, convey by Warranty Deed a minimum of 640 acres to the County of Hardee in the land and lake reclamation area for the purpose of a public recreation park.

CONDITION G. ROCK DRYER

MCC requires three million tons per year drying capacity, but will reduce the actual amount of rock dried by the amount of surplus sold to wet rock customers. Furthermore, the company will actively seek wet rock customers.

NOW, THEREFORE, BE IT FURTHER RESOLVED, by the Board, as conclusions of law, that these proceedings have been duly conducted pursuant to the provisions of Section 380, Florida Statutes, and the applicable provisions of the Hardee County Mining and Earth Moving Ordinance, and that based upon the record in these proceedings MCC has sustained and proved all the material allegations and assertions made

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by it in the above-mentioned documents, and that MCC is entitled to the relief prayed and applied for in said applications, subject to the conditions, restrictions, and limitations hereinafter set forth.

Appendix D

Consumptive Use Permit

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

IN RE:

MISSISSIPPI CHEMICAL CORPORATION)
CONSUMPTIVE USE PERMIT)
APPLICATION NO. 27703567) ORDER NO. 77-9
"WORK OF THE DISTRICT" PERMIT)
APPLICATION NO. 76-326)

ORDER GRANTING PERMIT PURSUANT TO HEARING BEFORE GOVERNING BOARD

This matter came on to be heard by the Governing Board of the Southwest Florida Water Management District at a public hearing on May 4, 1977. Said public hearing, being duly and properly noticed, was conducted at District Headquarters, 5060 U.S. Highway 41 South, Brooksville, Florida, and all parties hereto were present or given the opportunity to be present, and together with the general public, were given an opportunity to present testimony and evidence. The Board, having reviewed the applications and all documents in the File of Record, having heard testimony, and having received and examined all documentary evidence, makes the following

FINDINGS OF FACT:

1. Pursuant to Chapter 373, Florida Statutes, and Chapter 16J, Florida Administrative Code, Mississippi Chemical Corporation has made application (Application No. 27703567) to the Southwest Florida Water Management District for a consumptive use permit authorizing the average annual withdrawal of 16,981,920 gallons of water per day (gpd) and the maximum daily withdrawal of 33,850,500 gallons per day (gpd) in Hardee County, Florida. The applicant presently owns, controls, or will own or control (prior to initiation of consumptive water use) approximately 14,719 acres of land in Hardee County, Florida. The applicant proposes to withdraw the water for the purpose of mining and beneficiating 3 million tons per year of phosphate rock

2. At the present time 11,501.4 acres of the foregoing 14,719 acre tract is serving as a source of water

supply for persons withdrawing water under existing use permits, to-wit:

Donald E. and Susan Smith - Permit No. 27703508
Doyle E. Carlton, III - Permit Nos. 27703518, 27703519, and 27703520
Jane Carlton - Permit No. 27703521

3. The foregoing existing consumptive use of 5,579,589 gallons per day on an annual average basis is 41% less than the average water crop throughout the District and is being withdrawn for the purpose of providing ditch irrigation of approximately 5,000 acres of improved pasture. This existing use represents about 15 inches of irrigation water applied to the pasture per year.

4. The withdrawal proposed by the applicant herein might affect the foregoing named existing legal uses of water, but, as provided above, the applicant will own or otherwise control all portions of the tract, including those subject to the existing agricultural use described above, prior to the initiation of its consumptive use. Upon commencement of the withdrawals by the applicant, the withdrawal by the "existing users" is to be reduced and ultimately terminated in accordance with the terms of the written agreement (dated April 12, 1977) between the applicant and said "existing users" on file with the District.

5. The applicant proposes to withdraw the water in the following manner:

a. When the applicant achieves ownership or control of the subject tract, comprising some 14,719 acres of land in Hardee County, Florida, the maximum authorized withdrawal therefrom shall be no greater than 16,981,920 gallons of water per day on an annual average basis and no greater than 33,850,500 gallons per day on a maximum daily withdrawal basis. These maximum withdrawal rates include those amounts which could otherwise be withdrawn by the above named "existing users" under their existing use permits. By agreement between the applicant and said "existing users", it is contemplated that as the applicant's withdrawal rate increases, the withdrawal rate of the "existing users" will decrease as required to insure that maximum levels specified herein are not exceeded. The applicant will be responsible for coordinating the termination of existing uses as the new uses are phased in.

b. During the first three (3) years following commencement of mining operations, the total withdrawal for phosphate mining and beneficiation purposes is to be from the Floridan Aquifer by means of six production wells. Thereafter, commencing with the fourth year of mining operations, the applicant proposes to divert water from Brushy Creek, a tributary of the Peace River, to a surface water storage basin to be constructed by applicant on its lands, and hereinafter referred to as the Brushy Creek Storage Basin. The applicant proposes to maximize the quantity of water diverted to the storage basin by diverting such amounts as may be required to fill, or attempt to fill, the basin to capacity, while simultaneously maintaining minimum flows in Brushy Creek, downstream from the point of diversion. The applicant has submitted an application for a "Work of the District" Permit (16J-1.051, F.A.C.) for the proposed weir structure and the proposed diversion of water. (Application No. 76-326)

c. The applicant proposes that the subsequent withdrawal of water from the Brushy Creek Storage Basin will not exceed 5,860,000 gallons per day on an average annual basis or 12,942,720 gallons per day on a maximum daily basis. However, subject to the foregoing maximum limitations, the applicant proposes to maximize the use of this available surface water by according its withdrawals from the storage basin such priority over its withdrawals of ground water as is consistent with good water management practices in order to minimize the impact of applicant's proposed operations upon the ground water resources of the tract and area. In any event, the combined withdrawal from the Brushy Creek Storage Basin and the six production wells is not to exceed the total average annual withdrawal authorized herein of 16,981,920 gallons per day or the maximum daily withdrawal authorized herein of 33,850,500 gallons per day.

d. The applicant further proposes to maintain monthly minimum rates for flow for Brushy Creek downstream along

Brushy Creek from the point of diversion to the Brushy Creek Storage Basin. The monthly minimum rates of flow shall be computed on an average monthly basis. The applicant is to continuously monitor the flows on Brushy Creek and has proposed that the Governing Board of the Southwest Florida Water Management District retain authority in the requested permit to increase or otherwise modify the proposed monthly minimum rates of flow where deemed appropriate by the Governing Board in order to protect fish and wildlife, promote the public health and safety, or otherwise safeguard the public interest.

e. The applicant has acknowledged that its mine pit dewatering operations within approximately 450 feet of its property boundary could cause the water table under lands not owned, leased or otherwise controlled by the applicant to be lowered more than three (3) feet. The applicant proposes to obtain the written consent from all persons owning, leasing, or otherwise controlling lands within 450 feet of any proposed pit dewatering project prior to the excavation and dewatering of the pit.

f. The applicant proposes to install and construct such monitoring facilities in the vicinity of its lands as may be necessary to give early indication of changes in the conditions of the water resources in the area, as designated by the staff of the District and as specified in the consumptive use permit attached to this Order.

6. The applicant has conducted extensive aquifer tests on the property in question for the purpose of predicting the effects of the proposed withdrawals upon the hydrologic system and upon existing legal users of water. The data collected during these tests has been submitted to the District for review and study. The Board is of the opinion and so finds that if the applicant withdraws the water in the quantity and in the manner specified above:

a. The proposed withdrawal will not cause the level of the potentiometric surface to be lowered below any existing regulatory level established by the Southwest Florida

Water Management District.

b. The proposed withdrawal will not significantly induce saltwater intrusion.

c. The proposed withdrawal will not cause the water table to be lowered so that the lake stages or vegetation will be adversely and significantly affected on lands other than those owned, leased or otherwise legally controlled by the applicant.

d. The proposed withdrawal of water from Brushy Creek will reduce the rate of flow by more than 5% at the time and point of withdrawal. The Board finds that such withdrawal is consistent with the public interest by making efficient use of available surface water sources, while requiring the applicant to maintain the monthly minimum rates of flow specified herein.

e. The proposed withdrawal will not cause the level of the potentiometric surface under lands not owned, leased or otherwise controlled by the applicant to be lowered more than five (5) feet.

f. The proposed withdrawal will not cause the level of the water table under lands not owned, leased or otherwise controlled by the applicant to be lowered more than three (3) feet. However, when mine pit dewatering occurs within approximately 450 feet of the property boundary, the water table under lands not owned, leased, or otherwise controlled by the applicant could be lowered more than three (3) feet. The Board finds that this potential adverse impact is consistent with the public interest provided written consent and permission is obtained from the adjacent property owners prior to commencement of the pit dewatering projects.

g. The proposed withdrawal will not cause the level of the surface of water in any lake or other impoundment to be lowered more than one foot unless the lake or impoundment is wholly owned, leased or otherwise controlled by the applicant.

h. The proposed withdrawal will not cause the potentiometric surface to be lowered below sea level.

i. The proposed withdrawals for mining and beneficiation operations will consumptively use about 81% of the withdrawal authorized by this Order.

j. The proposed consumptive use of 14,084,640 gallons of water per day from 14,719 acres of land owned, leased or otherwise to be controlled by the applicant is equivalent to a withdrawal at the rate of 349,269 gallons per year per acre, which is 4% less than the average water crop throughout the District.

k. There are insufficient monitoring facilities in the vicinity of the applicant's lands to give early indication of any changes in the conditions of the water resources in the area. The Board finds that it is appropriate to require installation of flow-metering devices and installation or construction of other monitoring facilities as described in the consumptive use permit attached in Exhibit "1".

l. The proposed weir structure within and the diversion of water from Brushy Creek will:

(1) Not place fill material, or any non-water use related structure within the mean annual floodplain of a lake or other impoundment, or of a stream or other water course;

(2) Not cause significant adverse effects on lands not owned, leased, or otherwise controlled by the applicant by drainage or inundation;

(3) Restrict or alter the rate of flow of a stream or other watercourse within the floodplain of a twenty-five (25) year flood;

(4) Not extend beyond a line of encroachment established by the Board;

(5) Cause an increase or decrease in the rate of flow of a stream or other watercourse by 5% or more;

(6) Not cause an increase in the peak rate of flow or total volume of storm runoff by 10% or more from lands owned, leased or otherwise controlled by the applicant.

m. The Board finds that the proposed diversion from Brushy Creek is not inconsistent with the public interest because it permits the applicant to make efficient use of available surface water, thus minimizing the effect of its mining and beneficiation operations on the ground water resources of the area. Maintenance of minimum monthly flows downstream from the diversion will minimize the impact of the diversion and permit the public interest to be safeguarded.

n. The applicant has advised the District Staff and this Board that it will need additional authority from the District in the future to withdraw additional limited quantities of water from relatively shallow wells for purposes of obtaining "sealing water" for use in its mining operations.

In accordance with the foregoing, and in consideration of applicable laws and regulations, the Board makes the following

CONCLUSIONS OF LAW:

1. The applicant has established that the intended consumptive use, as described herein,

a. Is a reasonable, beneficial use;

b. Is consistent with the public interest; and

c. Will not interfere with any legal use of water existing at the time of application.

2. The applicant has shown good cause why the Board should grant exception to the provisions of Section 16J-2.11(4)(c), Florida Administrative Code, in connection with pit dewatering operations within approximately 450 feet of the applicant's property boundary. The effect of such pit dewatering operation upon the water table of adjacent lands is temporary and, if not objectionable to the adjacent property owner, consistent with the public interest.

3. The applicant has shown good cause why the Board may grant an exception to the provisions of Section 16J-2.11(4)(a), Florida Administrative Code, in connection with the diversion of water from Brushy Creek. Although the withdrawal will exceed 5% of the rate of flow at the time and point of withdrawal, the Board finds that such withdrawal is consistent with the public interest provided the minimum monthly rates of flow are maintained downstream from the point of diversion.

4. The proposed weir structure within and diversion of water from Brushy Creek is:

(a) a reasonable and beneficial activity; and

(b) not inconsistent with the public interest.

5. The applicant has shown good cause for this Board to grant exceptions to the provisions of Sections 16J-1.06(4)(c) and 16J-1.06(4)(e), Florida Administrative Code. The proposed weir structure and diversion of water from Brushy Creek is not inconsistent with the public interest provided the minimum monthly rates of flow are maintained downstream from the point of diversion.

6. The intended consumptive use is in compliance with the requirements of Chapter 373, Florida Statutes, and Chapter 16J, Florida Administrative Code.

7. In the event the applicant needs additional authority from the District to withdraw additional limited quantities of water from relatively shallow wells for purposes of obtaining "sealing water" for use in its mining operations, applicant must obtain a separate, supplemental consumptive use permit for such withdrawal, pursuant to Chapter 16J-2, Florida Administrative Code, before commencing such withdrawal. Modification of this Order, or the permit authorized hereunder, need not occur for this purpose.

WHEREFORE, UPON CONSIDERATION, it is

ORDERED

1. That the Executive Director of the Southwest Florida Water Management District or a duly delegated member of his staff be, and he is hereby, authorized and directed to issue a consumptive use permit pursuant to the above named applicant in substantially the form and subject to the terms and conditions, set forth in Exhibit "1" attached hereto; and

2. That the Executive Director of the Southwest Florida Water Management District or a duly delegated member of his staff be, and he is hereby, authorized and directed to issue a "work of the District" permit, pursuant to Section 16J-1.051, Florida Administrative Code, to the above

named applicant in substantially the form and subject to the terms and conditions set forth in Exhibit "2", attached hereto.

SOUTHWEST FLORIDA WATER
MANAGEMENT DISTRICT

DATE:

By: Derrill S. McAteer
DERRILL S. McATEER,
CHAIRMAN

ATTEST:

N Brooks Johns
~~THOMAS [illegible]~~
ASST. SECRETARY, N. BROOKS JOHNS

SEAL

Approved
As To Form
5-3-77
Board Counsel

E-1

Appendix E

Cultural and Archeological Consultations

Secretary of State

STATE OF FLORIDA
THE CAPITOL
TALLAHASSEE 32304
(904) 488-3680

GEORGE FIRESTONE
SECRETARY OF STATE

February 11, 1981

In reply refer to:

Mr. Louis Tesar
Historic Sites Specialist
(904) 487-2333

Mr. Robert B. Howard
Chief, EIS Preparation Section
United States Environmental Protection Agency
Region Four
345 Courtland Street
Atlanta, Georgia 30308

Re: 4SA-EIS
Cultural Resource Assessment Review Request
"3.5.3 Historic and Archaeological Resource"
from Draft EIS, Mississippi Chemical Corporation (MCC)
Hardee County Phosphate Mine

Dear Mr. Howard:

In accordance with the procedures contained in 36 C.F.R., Part 800 ("Procedures for the Protection of Historic and Cultural Properties"), we have reviewed the above referenced project for possible impact to archaeological and historical sites or properties listed, or eligible for listing, in the National Register of Historic Places. The authorities for these procedures are the National Historic Preservation Act of 1966 (Public Law 89-665) as amended by P.L. 91-243, P.L. 93-54, P.L. 94-422, P.L. 94-458, and P.L. 96-515 and Presidential Executive Order 11593 ("Protection and Enhancement of the Cultural Environment").

We have reviewed the above document and the information contained in the Florida Master Site File. We concur with the evaluation of the cultural resources presented in that document.

None of the three 20th century sites is historically significant, and three of the four aboriginal sites are so severely disturbed and eroded by 20th century land clearing and agricultural activities that they fail to satisfy the criteria for significance used in determining eligibility for listing on the National Register of Historic Places. Neither preservation nor salvage excavation or historic documentation is recommended for any of the above sites.

On the other hand, aboriginal site #1, which is recorded in the Florida Master Site File as site 8Hr5 and located in the NW¼ of the SE¼ of the SW¼ of Sec. 30, T34S-R24E, is potentially significant as it represents one of the northernmost sites of the Okeechobee Basin peoples. Since the upper levels of the site have been disturbed through land clearance activities some of the categories of data contained within the site have been lost. However, subsurface testing revealed that "...large portions (of this site) are still intact" (Draft EIS, p. 19-6). In view of this information and the site's significance as one of the few Okeechobee Basin type sites recorded in this area, it is deemed potentially eligible for listing on the National Register of Historic Places. Therefore, archaeological salvage excavation is recommended to record the data contained within this site. In view of the extensive alteration of the surrounding environment, site preservation is not recommended.

If you have any questions about our comments, please do not hesitate to contact this office.

On behalf of the Secretary of State, George Firestone, and the staff of the Bureau of Historic Sites and Properties, I would like to thank you for your interest and cooperation in preserving Florida's historic resources.

Sincerely,

George W. Percy

George W. Percy
Deputy State Historic
Preservation Officer

GWP:Teh

United States Department of the Interior
HERITAGE CONSERVATION AND RECREATION SERVICE
WASHINGTON, D.C. 20243

IN REPLY REFER TO: 436

Mr. Robert B. Howard
Chief, EIS Preparation Section
Environmental Protection Agency
345 Courtland Street
Atlanta, Georgia 30365

Dear Mr. Howard:

Thank you for your letter requesting a determination of eligibility for inclusion in the National Register pursuant to Executive Order 11593 or the National Historic Preservation Act of 1966, as amended. Our determination appears on the enclosed material.

As you understand, your request for our professional judgment constitutes a part of the Federal planning process. We urge that this information be integrated into the National Environmental Policy Act analysis in order to bring about the best possible program decisions. This determination does not serve in any manner as a veto to uses of property, with or without Federal participation or assistance. Any decision on the property in question and the responsibility for program planning concerning such properties lie with the agency or block grant recipient after the Advisory Council on Historic Preservation has had an opportunity to comment.

We are pleased to be of assistance in the consideration of historic resources in the planning process.

Sincerely yours,

Jerry L. Rogers

Jerry L. Rogers
Acting Keeper of the
National Register

Enclosure

E.O. 11593
DETERMINATION OF ELIGIBILITY NOTIFICATION
National Register of Historic Places
Heritage Conservation and Recreation Service

Name of property: Aboriginal Site #1

Location: Hardee County **State:** FL

Request submitted by: EPA/Robert B. Howard

Date received: 3-30-81 **Additional information received:** 5-28-81

Opinion of the State Historic Preservation Officer:

☒ **Eligible** ☐ **Not Eligible** ☐ **No Response**

Comments: "Site #1 is potentially significant"

The Secretary of the Interior has determined that this property is:

☑ **Eligible** **Applicable criteria:** D ☐ **Not Eligible**

Comments: This site contains substantial intact subplowzone cultural deposits and is significant for its potential to yield important information concerning Belle Glade phase lifeways outside the Okeechobee Basin core area in late prehistoric times.

☐ **Documentation insufficient**
(Please see accompanying sheet explaining additional materials required)

for **Keeper of the National Register**

Date: 6/12/81

FHR 8-265 2/79

E-6

402

Appendix F

Section 7 Endangered Species Act

Consultation

United States Department of the Interior
FISH AND WILDLIFE SERVICE
15 NORTH LAURA STREET
JACKSONVILLE, FLORIDA 32202

May 13, 1981

Mr. Robert B. Howard
Chief, EIS Preparation Section
Environmental Protection Agency
345 Courtland Street
Atlanta, Georgia 30365

Log No. 4-1-80-013

Dear Mr. Howard:

This responds to your letter of March 31 requesting consultation pursuant to Section 7 of the Endangered Species Act on Mississippi Chemical Corporation's plans to mine phosphate in Hardee County, Florida and its potential impact on threatened and endangered species.

Mississippi Chemical Corporation plans to develop a phosphate mine and beneficiation plant on approximately 23 square miles (14,850 acres) which it presently owns or controls, located 10 miles west of Wauchula in west central Hardee County. About 8,000 acres on this site have economically mineable reserves of phosphate ore. Construction is planned to commence in mid-1983 and to be completed in about two years. Mining will cover a 32-year period, with an average annual production rate of 3 million tons of phosphate rock.

The Federally listed threatened and endangered species that were identified as possibly occurring within the area of influence of this project were: bald eagle, red-cockaded woodpecker, Arctic peregrine falcon, American alligator, and eastern indigo snake.

After reviewing the information in the Technical Support Document II and a April 20 letter from Dames and Moore, it is our Biological Opinion that the proposed mining operation is not likely to jeopardize the continued existence of the eastern indigo snake. In addition we concur with your determinations that the red-cockaded woodpecker, bald eagle, Arctic peregrine falcon, and American alligator would not be adversely affected by the proposed operation.

Insofar as the eastern indigo snake is concerned, every effort should be taken to avoid injuring or killing this species. If an eastern indigo snake is encountered during the construction or mining operations, the animal should be collected. After the animal is safely removed from the area, Mr. Don Wood, Endangered Species Coordinator, Florida Game and Fresh Water Fish Commission, 620 South Meridian Street, Tallahassee, Florida 32304; telephone (904) 488-1960 should be contacted immediately. The technique for handling and keeping this species until the Florida Game and Fresh Water Fish Commission arrives is to place the snake in a cloth sack, for example a pillow case. It is important to keep the animal out of the sun, and we recommend that you place it in an air-conditioned building. We suggest that people working in the mine area be informed of the possible presence of these snakes, and that they are protected by both Federal and state laws. The snakes should not be harmed or harassed, but should be captured and the proper people notified.

An administrative record of this consultation is on file in this office.

This completes consultation under Section 7 of the Endangered Species Act. If there are any modifications made in the project or if additional information becomes available relating to threatened or endangered species, reinitiation of consultation may be necessary. This Biological Opinion is intended to assist Environmental Protection Agency in meeting its responsibilities under Section 7.

Sincerely yours,

Donald J Hankla

Donald J. Hankla
Area Manager